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ŒUVRES

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DRILL AND MANŒUVRES
OF
CAVALRY.

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A TREATISE ON

DRILL AND MANŒUVRES

OF

CAVALRY

COMBINED WITH HORSE ARTILLERY.

BY

MAJOR-GENERAL

MICHAEL W. SMITH, C.B.

COMMANDING THE POONAH DIVISION OF THE BOMBAY ARMY: LATE OF THE
FIFTEENTH HUSSARS AND THIRD DRAGOON GUARDS.

LONDON:
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1865.

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DEDICATED BY PERMISSION

TO

FIELD-MARSHAL

HIS ROYAL HIGHNESS

THE DUKE OF CAMBRIDGE, K.G.,

COMMANDING IN CHIEF.

PREFACE.

THE SUBJECT of this Treatise had long occupied the attention of the Author: but his services during the Crimean war, and subsequently during the suppression of the Indian mutiny, did not allow of his completing the manuscript till the year 1860, when his return from sick-leave to rejoin his regiment in India prevented its publication.

The delay has not lessened the importance of the subject; and as changes are contemplated in the drill of the British Cavalry, the Author's friends consider this a suitable time to offer, to those who feel an interest in the efficiency of the British Army, his ideas on what would conduce to the advantage of those branches of the service, of which the following pages treat.

Under these circumstances, and the absence of the Author (who is now in command of the Poonah Division of the Bombay Presidency) rendering impossible his personal supervision, I was asked to revise the manuscript and conduct the work through the press.

In this revision I have deviated in one point only from the original plan of the MS.—namely, in removing from the body of the work to an Appendix every calculation or argument involving a knowledge of trigonometry, or of more than the simplest rules of arithmetic. The results of these calculations still remain embodied in the work. It is hoped that, by these means, the Author's ideas are placed within reach of everyone who will accept the results of calculations carefully tested, and for the accuracy of which I can vouch: while those who may be unwilling to receive on faith these results, will find the steps by which they were arrived at fully set forth in the Appendix.

Without pledging myself to all the Author's views, I feel convinced that there is much of great value in the work, especially during the present state of transition of cavalry manœuvres; and as every detail proposed by the Author has reference to the better combination of Artillery with Cavalry, it is hoped that in both those arms of the service some attention will be paid, and, if possible, some trial given, to the Author's suggestions.

HENRY BRACKENBURY, Lieut. R.A.,
Assistant Instructor in Artillery.

Royal Military Academy: 1865.

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INTRODUCTION.

Effect of improved arms upon cavalry movements.

An opinion has been adopted by some, that owing to the increased range and accuracy of aim of the rifled cannon and small arms recently introduced, the movements of bodies of cavalry and horse artillery in the field will be no longer practicable. It is urged by those holding this opinion, that if the cavalry are massed out of range of the artillery, they will have to traverse so great a distance to reach the point of action when their services are required, that the opportunity will be lost, and they will be too late to produce an effect; that the ground to be passed over will be swept by the enemy's fire, and the destructive power of both artillery and small arms will be so great, as to break the formations and throw into disorder the advancing troops, rendering them incapable of action.

When improvements are made in any particular branch of the service, it seems generally to be expected that the entire system of tactics must in consequence undergo a radical change; but there are certain unalterable circumstances which hinder any one arm, no matter how perfect it may have become, from gaining such a preponderance as would prevent the effective action of the other arms. For instance, the conformation of the ground affording cover from artillery fire to cavalry and horse artillery, either when assembled together or when on the march to the point of action; the limits to human vision, which remain the same, however much the limits of the range of artillery and small arms may be altered; while artificial aids to sight are ill-adapted for practice against moving bodies, as their use must be attended with uncertainty and delay, the adjustments for long ranges and very accurate aim requiring both care and time; so that, when once within twelve or fifteen hundred yards of the enemy's artillery, a rapidly advancing body may be considered not much worse off now than formerly. In addition to these, many other facts will suggest themselves, all tending to prove that, in practice, the result of improvements like the present is often found to fall short of the anticipations founded upon theoretical reasoning.

Questions to be dealt with in forming a system of cavalry tactics.

Although there seems to be a generally prevailing opinion that some change in the present system is desirable, cavalry and horse artillery still remain arms of our service. The only question then to be dealt with is, how their action can be so combined as to produce the greatest effect, and to neutralise or make up for the modern improvements in the other arms of the service; in fact, to meet the circumstances and requirements of the present time. Rapidity, steadiness, combination, and simplicity are the chief points to be aimed at in forming a system of tactics adapted to the movements of cavalry and horse artillery.

Present systems will be analysed.

I shall in the first instance make a short analysis of the systems of the present day, in order to determine how far they meet these requirements, and wherein they are defective or ill-adapted to the purpose intended, or to present circumstances. I shall make this analysis principally with reference to our own and the French systems, which to a certain extent represent the different systems of the present day. I shall then state shortly the alterations I propose, with the details for carrying them into practice, and shall divide the subject as enunciated in the French ordonnance, a very similar arrangement being adopted in our own regulations. 1. Passer de l'ordre en bataille à l'ordre en colonne. 2. Marcher en colonne. 3. Passer de l'ordre en colonne à l'ordre en bataille. 4. Marcher en bataille.

Order of treating the subject.

Main features of proposed changes.

The main features in the changes proposed are as follows:—1. Greater simplicity throughout and less complication in the general arrangements, by which means the number of movements will be greatly reduced, and consequently the drill will be more quickly learnt and more easily retained in the memory. 2. The rejection of what is generally called the law of pivots, under the enactments of which we have suffered so long. 3. Alteration of the present position of the rear rank at half a horse's length from the front rank, to a position at such a distance as will admit of its acting as a support, without embarrassing the movement of the front rank, either in the advance or retreat, and without being mixed up in the disorder of the front rank. 4. A more simple arrangement for the change of direction in column, adapted to all circumstances and to all paces. 5. A more simple arrangement for the covering and column movements in general. 6. A more simple and rapid mode of forming line from column, adapted to formations on the move at the different paces, immediately upon issuing from roads or defiles, or to passing round the flanks of formed bodies. 7. A more simple arrangement for advancing or throwing back a flank, either in the advance or retreat, during the march in line. 8. Employment of the direct instead of the oblique échelons in these movements, as well as in the column formations. 9. A more complete and efficient combination of the different paces, particularly as applied to the combined movements of cavalry and horse artillery.

The following remarks bear on the changes proposed in the order above stated:—

Greater simplicity generally.

1. The more numerous the disturbing causes, such as the fire of artillery or small arms, difficult ground which it may become necessary to traverse in order to avoid such fire, &c., tending to produce disorder in formations and movements, the more simple should be the arrangements employed, as simple systems are less likely to be deranged, and if disturbed are more easily rectified than complicated systems. If it is desirable to train cavalry and bring them into working order rapidly, and to render them even partially efficient in a short time, it is not only important that the system employed should be very simple, and the movements to be acquired few, but also that they should be of such a nature that when the first rudiments are mastered, the cavalry shall be so far in a condition to act that they can be moved from one place to another without disorder, and that the instruction can be perfected during their service in the field.

Rejection of the law of pivots.

2. As a first and most important step towards simplicity, I should propose that we should disencumber ourselves of all the trammels and restrictions attendant upon the preservation of the pivot flank. This will not only give greater freedom of action to the troops, but will relieve the commander of the cavalry from the absorbing attention to details, consequent upon the preservation of the proper pivot flank, and the desire to avoid inversions. He will

thus be left at liberty to direct his undivided energies to more important matters. I have had some experience in this matter, and opportunities of forming a judgment on the subject were afforded me during the training of a large number of new levies. The men I had to deal with were Albanians, Arabs, Bulgarians, Anatolians, &c., and with the exception of a few officers and non-commissioned officers, who had been in the regular Turkish service, the system of which is similar to the French, none of them had any prejudices or previous habits to overcome with regard to pivot flanks, nor did they manifest that antipathy to inversion so strongly marked in the ranks of regular troops. These men were willing to learn, acquiring their drill rapidly; and observation quite convinced me that the non-pivot system is as easily learned and works as smoothly as the pivot system; and I think everyone who has practical experience in the matter will be of the same opinion, and will agree with me that this system would be particularly applicable to the present advanced condition of firearms, which renders the facility of forming suddenly and unexpectedly to either hand desirable. When first taking under consideration the combined movements of cavalry and horse artillery, it appeared to me that nothing effective could be done without, in the first instance, getting rid of this embarrassment. There seems to be a very general feeling prevalent that the time has arrived for emancipation from the law of pivots, with reference to cavalry movements.

Rear rank placed farther from front rank.

3. The alteration of the position of the rear rank has long been recommended by high authority, namely the Duke of Wellington, Lord Vivian, Lord William Russell, General Bacon, and others. A correspondence on this subject, extracted from the 'United Service Gazette' of March 12, 1853, is to be found in the appendix to Captain Nolan's history and tactics of cavalry; but besides the reasons there given for adopting what is called the rank entire system, I hope to show that many of our column and other movements are complicated and rendered difficult by the close proximity of the rear rank to the front rank. I have long been of opinion, and others agree with me, that the horses of the front rank would move more steadily at the faster paces if they were not embarrassed, excited, and pressed upon by the rear rank horses.

The arguments in favour of the present system seem to be the following:—that the ranks would appear too open and disunited, if the rear rank was removed; that the men would feel the want of their accustomed support immediately in rear, &c. &c. Without entering into a discussion upon this point it is sufficient to state that I do not advocate the removal of the rear rank altogether, but merely desire to place it in a position where it may act as a support to the rank engaged, without impeding its action, or being involved in its disorder; and I propose to furnish the details for placing it in this position and producing this effect.

More simple change of direction in column.

4. The change of direction in column is a most important point, particularly under existing conditions. Column movements and formations must now be made rapidly, and in all directions; it may become necessary to change the direction often and suddenly, and possibly to move or form under fire. If unsteadiness is produced by a change of direction, then when the changes are frequent and the pace rapid the whole body will be thrown into disorder, and rendered unfit for formation or action of any kind.

The power of moving smoothly, steadily, and rapidly in column, without being disordered when frequent changes of direction become necessary, is a necessity in a system which shall admit of true rapidity of movement. Consequently it becomes most important to construct a system of wheeling or changing direction in column, which, during the change, shall involve as little acceleration of pace on the wheeling flank as is consistent with due regard to time and space. In proportion as this can be effected, we shall be able to increase our speed without producing disorder, either in movement on the direct line, or during the change of direction.

5. Although our present system of covering in column may be very well adapted for infantry movement, a slight change which I shall propose would render it more applicable to the quick movement of cavalry.

Better system of covering in column.

6. According to our present system, formations from column to line are effected by the wheel, either simultaneous or successive, of the ranks of the column; or else by means of an intermediate formation in oblique échelons. The advantages attending this formation are stated to be as follows: 'The preserving a general front during the march, enabling a body to change its front or position either on a fixed or moving point, retaining the power at any moment to stop the movement, form the line, and repel an attack.'*

Better mode of forming line from column.

However true this may be with regard to infantry movements, there are, I believe, many practical men who have doubts as to its holding good with regard to the quick movements of cavalry, even on the most favourable ground, and in the absence of all disturbing causes. I shall state my reasons further on for rejecting the oblique échelon formation, as a means of forming line from column, and adopting in preference the direct échelon formation, or else the immediate passage from column to line.

The most prominent of these reasons are as follows:

---

* Cavalry Regulations, 1862, par. 15, p. 159.

The oblique échelon formation adopted in our service is liable to be deranged by ground even slightly broken or intersected, and by the many casualties likely to occur on service.*

The principle of covering in oblique échelon is such, and the échelons are so connected, that the derangement of one of the parts communicates itself to and produces disorder throughout the entire system.

Such an arrangement is not adapted for rough work and rapid movement.

The fire of artillery and small arms has become more powerful, rendering the column movement, as well as the passage from column to the fighting order of the cavalry and horse artillery, upon approaching the enemy's position, more difficult and dangerous than formerly. We can only meet this change by making use of the conformation of the ground as a protection during the advance, and by forming immediately upon issuing from roads or defiles, without halting during the formation; as by a halt we afford a fixed mark for the enemy's fire.

The present systems seem principally to contemplate the halting of the leading portion of the column during the formation, after having advanced a certain short distance. Or if, as an exception, the formation is made upon the move, the whole body is first thrown into oblique échelons, and subsequently into direct échelons, which remain scattered in small bodies over the field, till they reach the alignment of the leading rank of the column.

---

* The French have substituted small squadron columns for this formation, which can thread their way through obstacles, and are not so liable to derangement from the causes just mentioned.

The oblique échelon principle also absolutely requires that, upon issuing from a defile of any description, the whole length of the column shall have completed the exit before the formation is commenced.

It must be evident that this is ill-adapted to present circumstances.

I propose to substitute a very simple arrangement for the line formation from column, immediately upon issuing from defiles, or upon approaching the enemy's position. The formation to commence, if required, as soon as the head of the column issues from the defile, and to be continued on the move at the different paces, the line gradually augmenting during the advance.

This formation will be effected by the passage of each unit of the column at once from column to line, the formed portion covering and protecting the portion still in column; or else by means of an intermediate formation in direct échelons.

It will also always be known within what distance, according to the pace used, any given formation can be completed, and consequently the rate of the advance can be regulated by the distance of the enemy's position and other circumstances; of course it will be equally practicable to form by halting the leading rank, if the occasion should requre it.

This matter will develop itself more fully as the subject is continued.

Direct instead of oblique échelons employed generally.

7 & 8. The reasons already stated for discarding the oblique échelon in forming the line from column would lead me also to prefer the direct échelon formation in the changes of front or position, and I think it will be found that the formations which I shall propose are more simple and practical than the present, and the movements required to effect the necessary changes fewer in number.

Correct combination of paces.

9. In order to carry out cavalry formations on the move steadily, as well as rapidly, a correct combination of the paces employed will be necessary.

With reference to the movements of horse artillery in combination with those of cavalry, we have in the first instance, in the advance, to bring the artillery to the front from their place in column. Then, in order to protect the formation and advance of the cavalry, we must divide the artillery into two or more portions.

These portions must take up positions successively in advance of the cavalry, so as mutually to support each other; the fire of each portion covering and protecting the other while coming into action.

In order completely to support and protect the advance and formation of the cavalry, the distance between the positions successively taken up by the artillery must be such as will give them time to deliver a certain number of rounds, before the position becomes masked by the gradual advance of the cavalry. At the moment immediately preceding the attack, the artillery must be in a position to deliver their fire of canister at close quarters, limbering up and moving to their proper position immediately upon the cavalry passing them to the charge. In the retreat of the cavalry, whether by alternate bodies or otherwise, the artillery must act upon the same principle, each portion of the artillery in turn protecting and covering the limbering up of the other portion.

Advantages of simplicity and well-combined paces.

This is a mere outline, but it is sufficient to show that, in order to fill in the details correctly, in the first place there must be a perfect combination of the paces employed; and in the second place, the arrangements in all their details must be so simple (the same thing being always done under the same circumstances), and the rules of execution must be so plain and unmistakable, that there will be no necessity for detailed instructions at the moment of action; but that everyone shall know his proper place, the time to act, and the particular *rôle* he has to play.

Unless these conditions are fulfilled, the two arms will become an impediment instead of an assistance to each other in rapid movements. If, however, a system can be established, by means of which the cavalry and horse artillery can act rapidly and steadily together to the last moment preceding the attack, or during a retreat, it will be admitted that the power of thus working these two arms in concert will give a great advantage to those who possess it.

To work out in detail such a system is the problem to be solved.

I have done my best, have taken much trouble, and spared no pains to arrive at a solution, and I will leave others to judge how far I have reached a successful result.

CAVALRY MOVEMENTS.

CHAPTER I.

PACE.

BEFORE entering upon the discussion of our proposed changes in the present movements and formations of cavalry, alone or combined with horse artillery, it is necessary to establish a system of paces suitable to both those arms, and adapted to the alterations which will be proposed.

Method of expressing pace.

In order to express definitely the pace, rate, or velocity, whichever it may be called, with reference to the movements of troops, we must determine upon some period of time and some measure of distance as units of time and space respectively. Having done this, we can express the velocity by stating the number of the units of space described or passed over in one unit of time. In our cavalry regulations we have taken an hour as the unit of time, and a mile as the unit of space. The French take a minute as the unit of time, and a mètre as the unit of space. The first thing therefore to determine, is what these units of time and space should be. In cavalry field movements, when the pace is rapid, distances appreciable in practice may be passed over in less than a minute. The second is therefore proposed as the unit of time.

In treating of uniform motion when the second is taken as the unit of time, a foot, or twelve inches, is generally taken as the unit for measuring space; but as the average stride of a horse, even at the walk, is little less than a yard, a foot would be too small a unit of measurement, and the selection of it would tend unnecessarily to encumber calculation. The yard is therefore proposed as the unit of space.

Proposed rates of pace.

The next thing to be done is to regulate the velocity, or determine the rates of the different paces.

The walk should be at the rate of two yards per second.

The trot at the rate of four yards per second.

The gallop of manœuvre at the rate of six yards per second.

The gallop out, or medium gallop, at the rate of eight yards per second.

The fast gallop, only to be used for short distances and on special occasions, at the rate of ten yards per second.

The two last paces being especially applicable to the horse artillery.

Advantages of these rates.

If this standard were admitted—consisting of an arithmetical series of five numbers, of which the extremes are two and ten, and the common difference two—it would be a most important step towards simplification. In order to ascertain the distance in yards passed over in any given time at any given pace, it would only be necessary to multiply the time in seconds by the term of the series corresponding to the given pace; or, to ascertain the time in seconds occupied in passing over any given distance at any given pace, it would only be necessary to divide the distance in yards, by the term of the series corresponding to the given pace.*

But simplicity alone would not be a sufficient reason for adopting such an arrangement, were not these rates also the most suitable for field movements in general, and the best adapted for combined movements at a rapid rate. Most people are so accustomed to measure the velocity of moving bodies by a reference to miles and hours, that, in order to realise what these proposed rates actually are, we must refer them to this generally adopted standard. The rate of the walk would be the same as that at present used in our service, viz. four miles per hour; or rather, the difference between the two rates is so slight as to be disregarded in practice, amounting in time to only one minute and twenty

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* Let v stand for the pace (being either 2, 4, 6, &c., according as the walk, trot, gallop of manœuvre, &c., is employed), t for the number of seconds during which the movement lasts, s for the number of yards passed over during the movement. Then by the simple formula for uniform motion—

$$s = v\,t$$

$$v = \frac{s}{t}$$

$$t = \frac{s}{v}$$

seconds in an hour, or in distance to forty yards in one mile. This slight difference need not be taken into account in practice; for in pacing, whether on foot or horseback, if we can always hit off our miles within forty yards, we shall find our military sketches close very satisfactorily. Taking this into consideration together with the comparatively short spaces of time and distance involved in field movements, we are fully warranted in considering a velocity of two yards in a second practically equivalent to a rate of four miles per hour.

The proposed trot would be at the rate of 8 miles and 320 yards per hour (about eight miles and a quarter), rather more than a quarter of a mile per hour slower than our present rate.

The gallop of manœuvre, at the rate of 12 miles and 480 yards per hour; about a mile and a quarter per hour in excess of our present rate.

The gallop out, or medium gallop, at the rate of 16 miles and 640 yards per hour.

The fast gallop, to be used for short distances and on special occasions, 20 miles and 800 yards (20½ miles) per hour.*

The walk. The walk should remain as it is, at the rate of four miles per hour; for, although this pace is fast, and faster than that used in other services, it is good for many reasons that the horses should be habituated to a lively pace at the walk. If we are accustomed to walk fast, we can keep up a rapid pace without inconvenience for a length of time, and for long distances, and more easily still for short distances. Habit is powerful with horses as well as with men, and practice will make a fast walk easy. Moreover, unless the pace is kept up to the mark, both men and horses will most likely become careless and slovenly, and the pace will be slow and uncertain.

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* Vide Appendix, Note 1.

In extended formations and movements, when working in brigade or division, even a slight difference in the rate of pace will tell when seconds become of importance; it is therefore desirable that for field movements the walk should be as fast as practicable. Whether the rate of four miles per hour can be kept up during long marches is another consideration; when the retarding elements of bad roads, bad weather, and fatigue, come into action to derange the pace. Habit, however, does wonders; and if the horses are accustomed to a fast walk at exercise and in field movement, they will be more likely to keep up a lively pace on the march. Such a pace, steady and fast instead of slow and irregular, tells most favourably on the march; it gets the men and horses in earlier to their camping ground; the men are a shorter time in their saddles, and the horses are a shorter time on the road; which should compensate for the additional exertion of muscle required to keep up a quick pace.

This is, of course, only with reference to cavalry and horse artillery, when marching by themselves; circumstances may render it necessary that the pace be regulated by that of the troops of other arms, with whom the cavalry and horse artillery may be marching; but this retardation of pace should be avoided as much as possible. We should also have custom on our side in retaining the rate of four miles per hour; this pace has been long established, and we may therefore conclude has been found to answer.

The trot.

The proposed alteration in the rate of trot is not considerable; the proposed rate being only 560 yards per hour slower than the present rate. A slow pace is by no means to be advocated if we can really command a fast one. But a trot should, as far as possible, be a bonâ fide trot of all the horses in the ranks, and not something between a trot and a canter. The trot is intended to be used when it is required to make a movement or a formation more rapidly than is possible at the walk, but at the same time with perfect steadiness, and without blowing, or, what is of as much consequence, over-exciting the horses. In India, where a great proportion of our cavalry is at present, and where trotting is not the best pace, a trot of a little more than eight miles an hour is all that can be got without breaking the pace out of the average class of cavalry horses when moving in a body; for in order to keep the pace unbroken we must make the trot no faster than the fastest trot of the slowest horse.

Points to be considered in regulating the faster paces.

In regulating the rate of the faster paces (the trot and gallop) two most important points must be taken into consideration:

1. The change of direction in column.
2. The combination of the paces by which forma-

tions on the move and other movements may be effected.

With reference to the change of direction in column, it is evident that in order to produce it, there must be a certain acceleration of pace on one flank of each rank of the column in succession while effecting such change; and it is most important to the steadiness of the movement that, on the wheeling flank, the pace necessary to produce the change of direction should be as moderate as possible; for even a slight alteration in the rate of manœuvre will tell sensibly in this matter. In the mode of changing direction about to be proposed, and upon the supposition that the column is moving at the rate of trot proposed, the pace necessary on the wheeling flank will only require the rate proposed for the gallop of manœuvre to be sustained for about four seconds, after which the trot would be resumed.

With reference to the combination of the paces with each other, we must consider the relative proportion of their rates. For instance, in formations from column to line on the move, the sooner the rear of the column can catch up the front or moving point of formation the sooner will the formation be completed either in whole or part. If the walk be fast and the trot very slow, the process of forming while moving at the walk will be a slow one; and a line formation on the move cannot be accomplished at these paces within any reasonable distance or time. But, on the other hand, if the trot be fast and the gallop slow, the same objection applies, when a line formation on the move has to be effected by their combination. There must also be taken into consideration, especially when working with horse artillery, other movements, in which, if rapidity combined with steadiness is to be attained, a due relative proportion of the paces will be necessary. Even the slight alteration which makes the trot in the proportion to the walk of four to two will tell sensibly in this matter.

The gallop of manœuvre.

The proposed proportion between the gallop of manœuvre and the trot is six to four; which seems the best we could select for combined movements at those paces, having a due regard to all matters requiring consideration. Twelve miles an hour, which is about the rate proposed, will scarcely be considered beyond the galloping powers of our horses collectively in the ranks. We need not use this pace except when it is required to put on steam temporarily for a particular purpose, and then we should be able to do so with effect.

The medium gallop, and fast gallop.

The gallop out or medium gallop, and the fast gallop, are more applicable to the combined movements of cavalry and horse artillery than to those of cavalry alone. But the proportion of the paces adopted throughout (the common difference of the series being two), will produce an effective combination of the two last paces, either with the cavalry paces or with each other.

Difficulties of obtaining exactness generally overstated.

In treating of this subject of pace, the view of the matter which seems generally to be taken is— That although it may be desirable to establish some rules for the rate of pace to be observed in field movements, and even to mark out a distance and practice according to these rules,* when there is a favourable opportunity; still there are so many obstructions and disturbing causes, such as the state of the ground and the weather, and the powers and action of horses are so various, that in the field anything like exactness and uniformity of pace cannot be expected. The difficulties in this matter are somewhat exaggerated, and, with a little trouble and practice, a much closer approximation to exactness in pace may be attained than is commonly supposed. On different occasions I have timed and tested the rates of horses with a view to using them in reconnoitring and field sketching; and I have found the pace much more exact and uniform than I expected. To keep up the pace during field movements on bad ground and in unfavourable weather, will no doubt require greater muscular exertion, and produce more fatigue, than if the ground was good and the weather favourable; but if we have a certain distance to travel, and intend to do it at a certain rate, whether riding, driving, or walking, we are not thrown off our pace merely because it is raining, or snowing, or blowing, or the roads are not in particularly good order. We certainly could not keep up the pace across marshes, through brushwood, or over rocks; but this is not the sort of ground on which cavalry and horse artillery are usually worked.

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* To practice the paces it would only be necessary to measure off any convenient distance in yards, and then divide such distance by 2 for the walk, 4 for the trot, and 6 for the gallop of manœuvre, when the quotient will be the number of seconds which should be occupied in passing over the measured distance.

Fair exactness may be attained.

As to the difference in the conformation of different horses, it may require a greater exertion in one horse than another to keep up a certain pace, and what is play work to one animal may be hard work to another, but that is no reason why the pace should not be kept up if the rates are not excessive. It cannot too often be repeated that habit is all powerful, and will make the horses keep to a certain pace, if once they get accustomed to it. Those who can remember the old coaching days will be able to call to mind the many hundred coaches travelling daily and nightly in various directions all over England, and keeping their time more or less exactly, some to the minute, in all times and seasons, whatever might be the weather or state of the roads. To be behind time was the exception, and only caused by extraordinary circumstances. If this degree of exactness could be attained with the various teams of coach-horses, when the distances were hundreds of miles, surely we may try something of the same kind with our troop-horses, when the distances we have to deal with are only hundreds of yards.

Advantages of trying to obtain accuracy.

If, on account of certain disturbing causes and obstructions, or the uncertainty of action in the materials we have to deal with, we cannot obtain what is commonly called mathematical exactness, it is a great mistake to drop the matter altogether, and trust to chance; saying that rules are next to useless, and that in practice nothing like exactness can be attained.

If we had always acted on this principle to its fullest extent, we should have had no railroads, no steam-vessels, no navigation or astronomical calculations, all which are founded upon the principle of approximation within certain limits; and within these limits is found to exist an exactness sufficient for the practical purpose in hand.

We should deal with the subject we are now considering in the same spirit; and if we find the bounds which limit the approximation to exactness so extended, the obstructions so great, and the materials so unmanageable that nothing practically useful can be done, we must only confine ourselves to saying that the pace must not be too fast, for that would blow and exhaust the horses in the preliminary movements before the action commenced; nor too slow, for then the formation would take so long that we should not be ready for action in time.

But if, on the other hand, we find that, with practice and some trouble, an approximation to exactness of pace within sufficiently close limits is to be obtained, the time and trouble expended will be fully repaid by the additional power we shall obtain. We shall be able to combine the paces, and thus make our formations on the move, and all movements with great rapidity, exactness and steadiness.

CHAPTER II.

BREAKING INTO COLUMN FROM LINE: PRESENT SYSTEMS.

Columns of Route.

COLUMNS commencing at the lowest or smallest frontage are as follows:

Single files, or a column with a frontage of one file, in which each rear rank man follows his file leader of the front rank.

Files, or two in front. In our service the rear rank man is in line with and beside his front rank man. In the French service two front rank files are in line, with their rear rank men behind them.

Threes (called by us sections of threes). A column of three in front, each three of the front rank being followed by their respective rear rank men.

Fours (*colonne par quatre*). Used in the French and other services, but not in ours. In this formation four men are in front, each four of the front rank followed by their respective rear rank men.

Sixes (called by us threes), being three of the front rank in line with the corresponding three of the rear rank, making a front of six men abreast.

Eights (or *mouvement par quatre*). This column is used in the French service, but not in ours; and, as with our threes, the rear rank fours are abreast of the front rank fours.

Up to this point the columns are generally denominated Columns of Route, and here ends the mixing up of the rear rank with the front rank, and the complications and difficulties resulting therefrom, as well as the different arrangements for passing from one of these column formations to another.

Relative merits of columns of threes and fours.

The relative merits of the formation by threes and by fours is a subject which was at one time much discussed and disputed. Decker, in his 'Tactique des Trois Armes,' has given an outline of the discussion in his time, stating what was brought forward on either hand. He says: 'La chose ne peut être très-importante, car autrement tous les officiers expérimentés seraient depuis longtemps d'accord sur ce point.'

First objection to formation by threes.

He says also:—'La division par trois a soulevé bien des querelles, et le nombre de ses adversaires grossit chaque jour; selon ceux qui la défendent, trois largeurs de cheval sont égales à une longueur: mais ce calcul n'est pas exact. Un officier de cavalerie Saxonne, dans un article inséré au 12me cahier du "Journal Militaire Autrichien," dit contre cette division,' &c.

We have here the first objection, and that negative only, to the formation by Threes. As to the exactness or non-exactness of the calculation which estimates a horse's length as three times his breadth, it cannot be supposed that every horse is to bear exactly this proportion. Nothing more is intended than an approximation sufficiently close to facilitate the necessary calculations of distances and spaces occupied. In calculating infantry movements, each man is supposed to occupy a square of certain dimensions, or else a circle of a certain diameter, which means only that an average-sized man can turn freely in that space, and that when such space is allowed each man in the ranks can stand or move without constraint.

Space occupied by a mounted man in the ranks.

With the same understanding we allow a certain rectangular space to be occupied by each mounted man in the ranks. In our service this rectangle is estimated at eight feet in length, and we allow a yard from head to croup between the ranks. In the French service this rectangle is taken at nine feet in length. ‘Pour évaluer le front d’une troupe et la profondeur d’une colonne, il est nécessaire de savoir que chaque cheval monté occupe en épaisseur $\frac{1}{3}$ de sa longueur, cette épaisseur est d’un peu moins d’un mètre; afin d’éviter les fractions et d’arriver au même but par un calcul plus simple, ayant aussi égard à l’aisance qu’il est indispensable de conserver entre les cavaliers dans le rang, on l’a supposée d’un mètre (un grand pas); la longueur du cheval étant de 3 mètres, les deux rangs occupent 6 mètres de hauteur, sur lesquels il se trouve $\frac{2}{3}$ de mètre (deux pieds) de distance d’un rang à l’autre, espace nécessaire pour éviter les atteintes dans la marche.’

Here the depth of ranks is estimated at 6 mètres, which is stated to leave an interval of 2 feet between ranks. This shows that the French cavalry horse is supposed to stand in his rectangle of 3 mètres by

1, with 1 foot to spare in length. The mètre equals 39·3708 inches, therefore the French estimate of the depth of ranks at 6 mètres (19 feet 8 inches of our measurement) comes to much the same thing as our valuation at about 20 feet.

It is supposed that if plummet lines are hung from outside the knees of a mounted man, the plummets will touch the ground with a distance between them of about 2 feet 6 inches; and this, with our interval of 6 inches from knee to knee, gives a breadth of three feet or one yard for each man and horse in the ranks.

The French regulation allows 1 mètre (some three inches more) although the men in the ranks are supposed 'sentir légèrement de la botte la botte de leur voisin.' However, it is well known that this estimate is not quite correct, for it has been found that a squadron of forty-eight files in line, instead of occupying 48 mètres (or paces), in reality takes up only 38, 37, or 36 mètres, according to the arm of which it is composed; but in forming an approximation, and no more is attempted, it is better to be rather over the mark than under it.

Our own valuation of 8 feet by 2·5 feet for the space occupied by man and horse in the ranks is very good. If we add the six inches from knee to knee, allowed for freedom of action at all paces, it becomes 8 feet by 3. This is, in fact, much the same as the French estimate, for whether we allow nine feet for the length of the horse, including a portion of the distance between ranks, or take the length of the horse at eight feet, and then add the distance between ranks, the result is the same.

Second objection to formation by threes.

The next objection made to the Three formation is as follows: 'Réglementairement il faut converser sur le no. 2, mais dès que les chevaux sont fatigués la conversion, au lieu de s'exécuter ainsi, se fait involontairement sur les numéros 1 ou 3, les mouvements à pivots mobiles (no. 1 et 3) réussissent toujours mieux que ceux à pivots fixes (no. 2).' 'Pivots mobiles' must be here intended to express the pivots employed when in movement, namely numbers 1 and 3, not the 'pivot mouvant' in the usual sense. The conversion upon the number 2 or centre of Threes, requires on the part of the men a knowledge of the use of hand and leg; and sufficient training of the horses to make the latter answer the bit and pressure of the flanks in the turning and reining back necessary in this movement.

As soon as men and horses become tired or careless—indeed, in most cases, unless pains are taken to prevent it—the conversion will be made, as stated, upon the flanks instead of the centres of Threes; or rather, a mixture of the two methods of conversion will probably take place, neither one nor the other being exactly performed.

Third objection to formation by threes.

The next objection is as follows:—'Dans la marche de flanc, une pression est inévitable, s'il ne se forme pas des intervalles, dans la formation du front; et sur un terrain inégal remplir les intervalles est difficile ou insuffisant. Pour tout cela il faut une parfait instruction à la cavalerie que l'on n'obtient pas toujours d'hommes ayant peu de service : on peut encore ajouter que si un homme est tué, il faut aussitôt faire recompter dans le rang. Tous ces désavantages disparaissent avec la division par quatre, mais alors, le second rang ne doit pas trop serrer sur le premier.'

This objection embodies most of the arguments which are generally adduced in a comparison of the relative merits of the formations by threes and by fours; but this discussion, like many others, will be much simplified if in the first instance we clearly define and thoroughly understand what it is about which we intend to argue.

Comparison of columns of six and eight in front.

If it is intended to institute a comparison between the columns of six and eight in front, or in other words between three or four of the front rank with their rear rank abreast of them, we find that in our own and the French services, where these formations are respectively used, they are not employed under similar circumstances.

We use the formation by threes on roads, or in ground admitting of such formation, in changes of position, passage of lines, and movement of the open column to a flank; also in the formations, deployments, and wheel of the close column; in which cases the French have substituted for the movements by four, the movements by *pelotons*, or what we should call divisions of twelve. In the ordonnances 1857, the following passage occurs:—'La perte accidentelle d'une ou plusieurs files, cause toujours du désordre dans les

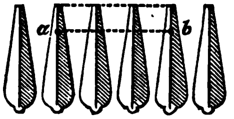
mouvements par quatre. Ces derniers, conservés dans l'instruction élémentaire du peloton et de l'escadron, peuvent continuer d'être employés quand il ne s'agit que de reprendre un intervalle perdu, ou de gagner quelques pas vers l'un de ses flancs.'

Here we find that the column of eight men in front is not used in the French service upon the many occasions in which we use the column of six, but is merely employed to close an interval or move short distances. We need not, therefore, enter into a comparison between these two descriptions of column. We see, however, that the confusion spoken of as appertaining only to the formation by threes, and the necessity to 'recompter,' consequent upon the loss of men in the ranks, does not belong only to the three formation, but on the contrary is given as a reason for excluding the eight formation from the French field movements, and for employing it only for correcting an interval, or moving a few paces to the flank or rear.

Distance between ranks.

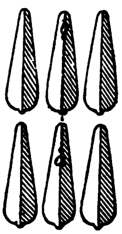
As to the distance in column of threes, supposing the conversion from line to be made upon corresponding points in the two ranks, that is to say upon the forehands of the horses of the rights, centres, or lefts of threes, we find, taking our conventional measurements, the distance *a b* between these corresponding points in line to be three yards (nine feet).

Fig. 1.



When in column after the completion of the conversion, the distance from the wheeling point *b* to the croup of the front rank horse, and from the head of the rear rank horse to the wheeling point *a* is occupied, making one horse's length, or eight feet. Subtracting this eight feet from the nine feet between *a* and *b*, there remains just one foot distance from head to croup. This is based upon the supposition that the horse turns upon the forehand, which it seems most natural for the animal to do under the circumstances, but even if he turns upon his centre, as laid down in our regulations, or upon any other point, it will make no difference in the distance after the conversion, so long as the pivots are supposed to turn upon corresponding points throughout the column.

Fig. 2.



This distance of one foot from head to croup is not sufficient to admit of freedom of action in movement; but the squadron interval, which is one-fourth of the extent of front of the squadron in line, if filled up allows an extension of two feet three inches, or one-fourth of the distance of nine feet. This, if added to the one foot already mentioned, gives more than one yard from head to croup. Our regulations, however, only permit half the squadron interval to be occupied by the extension, giving thus a distance of about two feet from head to croup. This extension, of course, involves a subsequent closing up before wheeling into line. In the column of fours, the corresponding points upon which the pivots turn are distant twelve feet instead of nine, and after the conversion there is still only one horse's length (eight feet) of this distance occupied; consequently there is a distance of four feet from head to croup, which admits sufficient freedom of action at all paces, and obviates the necessity of extension in movement or closing up before wheeling into line.

The French have solved the difficulty of choosing between these two columns by rejecting both in their field movements, and adopting extensively the peloton formation, modifying the close column distances accordingly.

Comparison of columns of three and four in front.

If the comparison is made between the threes and fours, properly so called, that is to say between our sections of threes and the formation *en colonne par quatre*, used in the French service, the question becomes simply a case of length *versus* breadth.

These columns are used in both services as columns of route under similar circumstances, and should therefore be considered simply as columns of route.

In both these formations the rear rank men enter the column in rear of their respective file leaders of the front rank. The distance allowed in the French service from head to croup, in this column of fours, is two-thirds of a mètre, a little more than two feet of our measurement. In our regulations no distance is laid down for sections, but three feet is the distance prescribed for files; we may therefore conclude that this is considered sufficient to allow freedom of movement at all paces. Such being the case, we may fairly take the column distance as the same for both threes and fours.

The depths of the columns of fours and sections are in the proportion of three to four; by diminishing the front of the column by one-fourth we increase the length or depth in the same proportion, or by increasing the column front by one-third we diminish the depth proportionately.*

Disadvantages of too long a column.

The depth of a column on the march is a matter of considerable importance, for in the first place it is evident that in forming line upon issuing from a road or defile, the rearmost rank of the column must during the formation pass over the whole length which the column occupied, as well as whatever additional distance may be necessary to complete the movement. Also the time occupied in forming must be calculated

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* The length or depth of the column, measured between corresponding points in the first and last ranks of the column, will amount to as many horses' lengths (8 feet) as there are ranks in the column, plus the same number of distances from head to croup between ranks, less one. If then we multiply the number of ranks by 11 (the column distance in feet), and subtract 3 from the product, we get the depth of the column in feet.

In order to find the number of ranks, divide the number of files in front when in line by the number of files in front when in column, and then double the quotient on account of the introduction of the rear rank into the column. Taking the distance from head to croup at 3 feet, and the horse's length at 8 feet of our measurement, then:

In column of fours formed from a peloton of 12 files—

$$\left(\frac{12}{4} \times 2 \times 11\right) - 3 = 63.$$

In column of sections formed from a division of 12 files—

$$\left(\frac{12}{3} \times 2 \times 11\right) - 3 = 85.$$

Or, a peloton or division of 12 files, in column of fours, would occupy in depth 63 feet, but in column of sections would occupy 85 feet.

from the commencement of the movement to the moment when the rearmost or last rank of the column arrives in line.

Occasions may easily be imagined when time, even seconds, becomes of inestimable value, in forming up in fighting order. Besides this, a long straggling column on the march, particularly when the force is large, is attended with many disadvantages. The rear is so far from the front that the transmission of orders is difficult, and arrangements must be made even for the passage of the trumpet sounds. At the short halts, if the column closes up, by the time the closing up is completed the time to move on again has arrived. Everyone who has much experience of marching must recollect the irksomeness and disadvantages of a long column.

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ntage.

All this would lead to the preference of the column of fours to sections of threes, but the frontage to be adopted for the column of route in marching is, as well as the depth, a matter of much importance, and the addition or subtraction of a single man will make a sensible difference. We do not always meet with roads or ground where four men can move abreast with ease to themselves. When men and horses are tired and out of humour, suffering from cold or oppressed by heat, perhaps sleepy and uncomfortable, suffocated by dust, or plunging through mud, elbow room is of more consequence, and a jog or a jostle more intolerable than can be well conceived by the inexperienced, and the ease and advantage obtained by having three men abreast instead of four becomes of vital importance. In these cases, opening out from both sides to the centre gives relief to men and horses, but this of course is not so practicable with four abreast.

When there are no regular roads, where rivers are to be crossed, villages to be passed through, and in many other cases, a file formation must of necessity be adopted: but most experienced men agree in considering that when there is anything like a respectable road to move upon, a column of three in front is the best formation for route marching.

Passage from line to column of route.

Having now exhausted this subject of threes and fours, we will return to the passage from line or formation *en bataille* to column. First, with regard to the columns hitherto spoken of, which do not exceed a frontage of eight; in the working of these it will have been perceived that the rear rank forms the chief obstacle; the nature of these columns rendering it necessary in some cases to place the rear rank men abreast of, or in line with their front rank leaders, and in other cases to introduce them into the front rank column, which must, therefore, be lengthened in order to make room for them.

The method adopted in the French service for breaking from line into these columns is as follows:—One, two, or four files, according to the front of the column, on the flanks from which the movement is to commence, move straight to their front; the remainder move forward in succession by ones, twos, or fours, as the case may be, as soon as the haunches of the horses of each rank arrive in line with the heads of the horses of the rank which is to follow. Each rank of the column in succession first marches straight to the front six paces (six mètres), which clears the rear rank, and then all the ranks except the leading rank incline one-fourth of a right angle, in the direction of the flank from which the movement has commenced, and remain on the incline until they encounter the line of the column, in which they take rank and move forward by a second turn of one-fourth. This movement appears open to the following objection: * If a narrow defile has to be entered, it is necessary to commence the movement at a distance from the entrance, equal to nearly twice and a half the length of the front of the line about to be broken into column. If the front were of considerable extent this would be a serious matter; but in order to obviate in part this objection, in the case of a regiment breaking into a column of fours, the incline principle is not carried farther than the first squadron; the second and remaining squadrons entering the column line by a change of direction.

Our system is different, being nothing more than a simple wheel of the column ranks to a flank, the rear ranks moving into the line of the front rank column

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* This movement requires a right-angled triangular space in front, of which the base is the extent of front, and the perpendicular the cotangent of the angle of inclination (22° 30′) at which the incline is made; this cotangent to radius unity is a little more than two and four-tenths.

in the case of sections and single files, and remaining abreast of their file leader in the case of threes and files.

Disadvantages of additional movements for advancing and retiring from a flank.

There are certain modifications adopted for advancing and retiring from a flank, by which a certain amount of space is saved. In order to save this small space, the number of movements is increased, although a wheel into column followed immediately by a change of direction would have all the effect of the advancing and retiring movements. While it may not be desirable that we should be obliged to commence our movement at a distance of two and a half times our squadron front from the defile we want to enter, we ought not to find ourselves so cramped for room, as to render of vital importance the space required for a change of direction by a column of so small a frontage, particularly as we have the squadron intervals to give room, when the movement is made by squadrons from line. By always adhering to this simple arrangement, in place of adding the present complications, we should reduce our preparatory drill by eight movements.*

The incline, or oblique individuelle.

The incline (*oblique individuelle*) used in the French service to break from a line formation to column of route, and employed in our own, the French, and other services, to form in line from the small columns of route, to increase and diminish the front of columns, and on other occasions, is nothing more than an oblique échelon of which the units are single horsemen. It consequently involves the same principles as the oblique échelon, and is subject to the laws which regulate this formation.*

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* Vide Cavalry Regulations, pp. 120–123.

The incline in the French service is made at an angle of 22° 30′, the quarter of a right angle; this leaves an interval of three inches (half interval) between files during the incline. As the knee of each man is supposed to come behind the knee of the man next him towards the hand inclined to, this half interval may be found sufficient if the movement is steadily and carefully made, and the pace is moderate. Our own incline is made at an angle of 30°, one-third of a right angle, which gives only one inch of interval between files, instead of half interval as in the former case; this difference of two inches in the interval may seem a very small matter, but it just makes the difference between having room to move and not having room. At best the oblique échelon in all its phases is a difficult movement for cavalry. Even when half interval is allowed between files, extension of files, or hanging back of a flank and loss of alignment follow if the movement is continued for any time, if the pace is quick, or the inclining body large; but in our service, where only one inch is allowed, either these evils or crowding and jostling in the ranks must be the result. Such extension requires subsequent closing in, and the movement becomes something between a file movement and an individual échelon. The incline at close files, therefore, should only be employed when the inclining body is small, the pace moderate, and the time short during which it is necessary to remain on the incline, and even then as seldom as possible. At open files the disadvantages attending this formation disappear, and the incline becomes a valuable movement, peculiarly applicable to the extension in skirmishing order. Nevertheless it might be better worked upon a principle, the details of which shall be given elsewhere, differing to a certain extent from that usually adopted.

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* Appendix, Note 2.

Breaking into open column from line.

Both the French and ourselves adopt the simplest of all methods of breaking into open column (*colonne avec distance*) from line, namely, the quarter circle wheel of the units of which the column is to be composed.

Disadvantages of extra movements.

But we encumber the movement with a certain amount of complication in the advance or retreat from a flank, in order to save room and time, and to preserve the pivot line. Even admitting that there may be circumstances in which these extra movements become convenient, and that a certain amount of time and space is saved by some of them, it should be well considered, before embodying them into a system, whether the advantages they afford compensate for the loading of the memory which they involve, and the lengthened duration of preliminary instruction necessitated by them. We should examine whether the simple principle, without incumbrances, cannot be worked in the space and time available under all ordinary circumstances, leaving to the genius and intelligence of commanders to devise some modification to meet extraordinary occasions. A simple wheel to either hand into column, and a subsequent change of direction, in accordance with the French system, would effect the purpose of advancing or retiring in column from line, only requiring a very little more room.

Advance in double column.

There is one case in which the leading portion of the column must advance straight to the front, the remaining units of the column wheeling to a flank, and that is our twelfth movement from line,[*] denominated the advance in double column, or in the more general movement of the French involving the same principle, called *passer le défilé.* But this is a distinct movement, requiring a particular adaptation of the general principle.

Passing along the front from a flank.

There is also a movement adopted in the French service for breaking into open column from line by successive movements, and by marching along the front from one flank to the other, called *rompre par la droite pour marcher vers la gauche*, or *vice versâ.* It is not necessary to analyse this movement, as it may be classed under the head of extra movements, imposed in a great measure for parade purposes, or to answer the requirements of the terrible law of pivots.

Passing along the rear from a flank.

There is another movement common to both services, and similar to the one just mentioned, in so far as that it is successive, and adapted for passing in column from one flank to the other. But with this distinctive difference, that one movement is along the front of the line, and the other along the rear. This latter movement is practical and useful for the following reasons. The line of retreat of the column is protected and covered by the portions of the force in line, each unit of the future column remaining fronted, and facing in the proper direction up to the last moment. To effect this movement each unit of the column in succession wheels about the half circle, passes to the rear to clear the serrefile rank, and then wheels again, so as to place the front of the column perpendicular to the intended line of movement.

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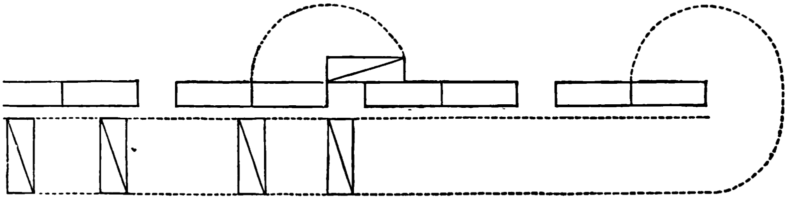
[*] Cavalry Regulations, p. 163.

Fig. 3.



Movement parallel to the original line.

I shall first suppose this line to be parallel with the original alignment, until the flank opposed to that from which the movement commenced is reached, or until it is necessary to take another line for the purpose of passing through a defile, road, &c.; this seems to be the only supposition contemplated in the French service. The chief point to be observed in order to make this movement go off smoothly and well, is the proper timing of the word 'March,' which puts each unit of the column successively in motion.

Our regulations tell us that 'officers must take care to wheel in good time to avoid loss of interval;'* but we are not told how we are to know when the good time has arrived.

This matter may have been thought so simple and palpable as to render superfluous any detailed directions in the matter, but the French do not appear to be of this opinion, for they give us the timing as follows. First as to the squadron:—'Le chef du deuxième peloton et successivement ceux des troisième et quatrième commandent "Peloton demi-tour à droite," quand le chef du peloton qui est à leur droite commande "Marche;" et ils commandent "Marche," lorsque ce même peloton a parcouru les trois quarts de sa première conversion.'

This, which disposes of the right flank squadron, is to be found in the preliminary squadron drill, and is referred to in the evolutions of the regiment.

We next come to the flank pelotons of the other squadrons on the hand nearest to that flank from which the movement has been commenced, and now the squadron interval comes under consideration.

The directions for timing these movements are as follows:—'Les capitaines des autres escadrons répètent successivement le deuxième commandement assez à temps pour commander "Marche," lorsque le quatrième peloton de l'escadron qui est à leur droite, après avoir fait son demi-tour et s'être posté en avant, a exécuté les trois quarts de son à droite.'

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* Cavalry Regulations, p. 192.

Movement oblique to the original line.

The last paragraph of the instructions and directions relative to this movement contained in our regulations is to the following effect:—'The intended direction of the column may either be parallel to the line or oblique to it, according as the defile or position towards which the retreat is to be effected happens to be situated.' * In the ordinary retreat in column from a flank, when all the units of the column break together into column and the movement is simultaneous, the general principle and details remain the same, whether the line of retreat is parallel or oblique to the original line, and consequently if time and space can be saved by it, the oblique line is advantageous, being in this case as well protected as the parallel line. But when the wheel of the units of the column is successive, as in the present instance, the case is widely different, and retiring along the oblique line instead of the parallel line, alters the whole character of the movement.

Instead of the retreat being effected by passing at once from line to a column, the line of movement of which is protected by the portion of the force remaining in line, the line passes in the first instance to a formation in direct échelons, and subsequently to column as each rank of the échelon reaches the oblique line of retreat. The passage from column to a front formation in line by means of an intermediate direct échelon formation is a good movement. The line is in that case gradually augmented as the ranks of the échelon

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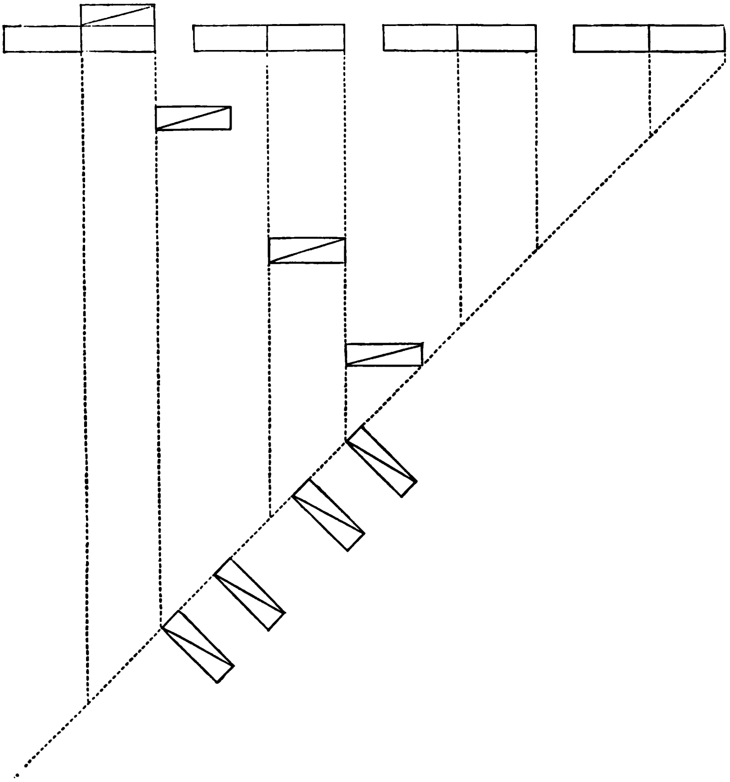
* Cavalry Regulations, p. 192.

successively reach the alignment; the line of movement of the column is protected and covered. The échelons have their faces in the right direction, the front of each rank is clear, and upon an emergency the portion in direct échelons might make a fight of it, if there was not time to complete the line formation, but the converse of this movement, that is, the passage from line to a retiring column, is quite a different matter.

Fig. 4.



Disadvantages of oblique retirement.

In the first place, the direct échelons have their backs to the enemy and their flanks exposed, which is not generally considered a fighting order. In the second place, although we certainly cut off an angle when the defile to be entered is some distance to the rear, and may thereby save a hundred yards or so of distance, and consequently some odd seconds of time, this ought not to be put in comparison with the disadvantages attendant upon introducing into our system a complicated and dangerous movement, the rules of execution for which vary with the obliquity of the retreat,* when we have a safe, simple and compact movement to answer our purpose. It is evident that if this movement is used, whether the line of retreat be parallel or oblique to the direction of the original alignment, the timing should be correct. The units of the future column must get the order to wheel from line at the proper moment, otherwise the different portions of the column will overrun each other, or else the column distances will be too great. The probable result of this would be that the retiring body would become a mass of confusion and unsteadiness.

Passage from line to close column.

There only remains the change from line to close column. This is effected in the French service by the peloton column, the close column distance being regulated accordingly, when the column is to front in the same direction as the original line; and when to a flank by wheeling into open squadron column, and then closing upon the squadron of formation. We make our formation to the front by the column march of threes; and to a flank by wheeling up the squadrons and closing, or by breaking into open column of troops, and forming close column.

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* Appendix, Note 3.

CHAPTER III.

BREAKING INTO COLUMN FROM LINE: PROPOSED ALTERATIONS.

Proposed open columns of two natures only.

THE open columns, or columns at wheeling distance (*colonnes avec distance*) to be of two descriptions only; 1. Column of threes, closed up to wheeling distance. 2. Column of divisions; the divisions to be, as in the French service, the fourth part of the squadron or unit when in line.

Minimum frontage of column of divisions.

This latter column, when the ranks of the column are double, i.e: composed of front and rear rank, and when the division leader leads in front of his division, must not have a less frontage than twelve files, for a less number would not leave a sufficient column distance from head to croup to admit of the free movement of the division leader in front of his division. But when the ranks are single, as in the system proposed, we shall not be so limited in this respect. A frontage of nine files, giving a column distance from front to front of nine yards or twenty-seven feet, and consequently a distance from head to croup of nineteen feet,* leaves full space for the free movement of the

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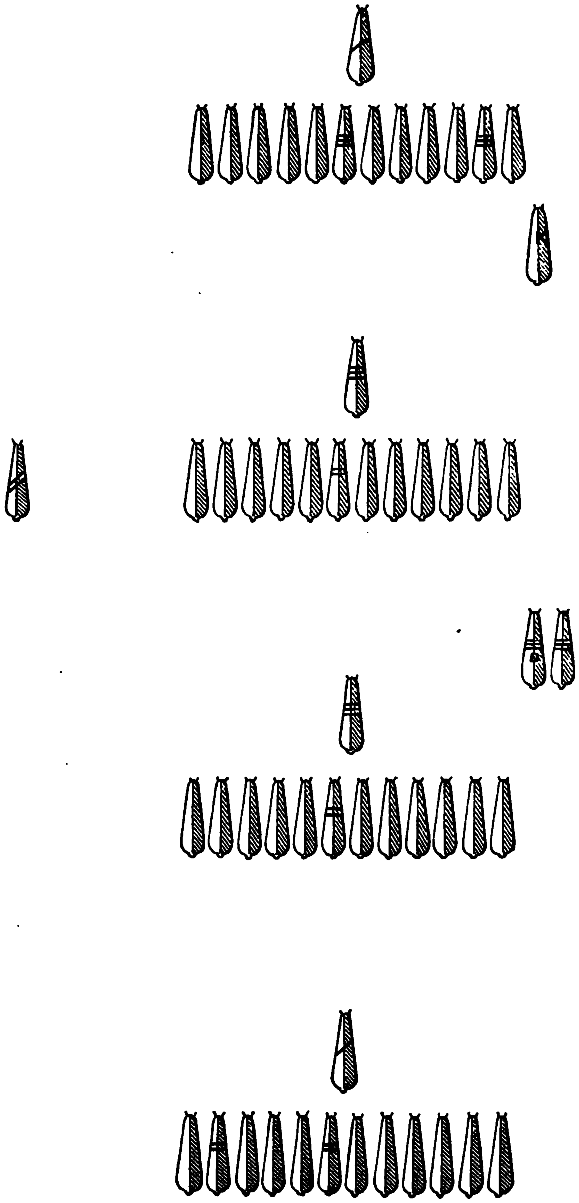
* The length of the horse = the depth of the column = 8 feet.

Fig. 5.



leader, who if he moves at a distance of three feet in front of his division, will have eight feet (a horse's length) between the head of his own horse and the croup of the rank of the column in his front.

If the squadrons are reduced below thirty-six files it will be better to use exclusively the column of threes.

Proposed method of breaking into open column.

In order to break from line into column at wheeling distance, the ranks of the column will simply wheel forward to either hand. The pivot man will turn his horse on the fore hand, when, if the horse is well ridden and well broken, the turn will be made upon the fore foot at the side towards which the rank wheels. The wheeling man will circle round at the correct distance from the pivot, looking inwards. The rest of the rank will dress by and conform to the movement of the wheeling flank.

Pace on the wheeling flank to be the pace of manœuvre.

The man on the wheeling flank of the leading rank of the column will wheel at the regulated walk, trot, or gallop of manœuvre, according to the pace ordered, or if on the move, at the pace at which the line has been previously moving. The men on the wheeling flanks of the remaining ranks of the column will regulate their pace by the pace of the man on the wheeling flank of the leading rank, so that all the ranks of the column shall arrive in column at the same moment.

To increase the pace on the wheeling flank beyond the rate of manœuvre, either in wheeling from line into column, or from column into line, is a mistake. The time saved by a variation of the pace in so small a distance as the quarter circle, when the radius is a division or a troop, is hardly to be appreciated even if the movement is perfectly carried out, and even if that small time were actually saved; but when we consider that what has been gained by extra speed will be most likely ultimately lost in the dressings and corrections consequent upon an unsteady and irregular movement (and a rush round into column or line will always produce a temporary unsteadiness), it will be admitted that the regulated and uniform rate throughout all the ranks of the column is in reality more effective for the passage from line to column or from column to line. This is more particularly the case when the manœuvre is executed on the move, for the horses which have to perform their part on the wheeling flanks having already got the rate and the stride, can easily keep the same without alteration during the few seconds occupied in, and the few strides required for, the wheel; but if they have to alter their pace both temporarily and suddenly, horses and men on the wheeling flanks will probably have different opinions as to the rate of pace; this method also, when moving fast, requires very good riding and breaking to regulate the rate by the leading rank after the first impulse is given.

I have found by experience that I had the power of wheeling steadily from column to line on the move, at the gallop, when the wheeling rate was not increased; but unsteadiness arose if it was increased.

Proposed simple method

When once in column the direction can be immediately changed to either hand if requisite. This will obviate the necessity of introducing into the system particular movements applicable to advancing or retiring from a flank, the disadvantages of which have been stated in the previous chapter.

advancing or retiring from a flank.

The front of the columns being small, according to the system proposed, the saving of space by these extra movements would be less even than when the front of the column was composed of troops; in fact would be so inconsiderable as in nowise to make up for the disadvantage of introducing extra complications. Under any circumstances, however, it is not consistent with the spirit of cavalry movement to form a system, in which simplicity of construction and freedom of movement are to be sacrificed, in order to save a few yards of space or a few seconds of time.

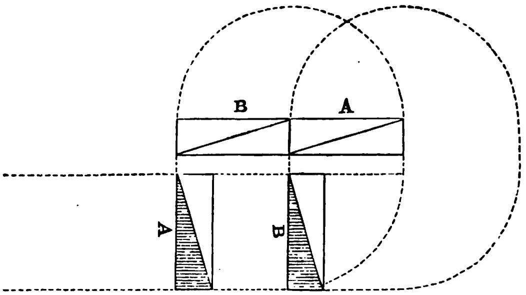
According to the proposed system of changing direction in open column, a clear space of about eighteen yards would be required on the flanks of the line. Under all ordinary circumstances this small space will be available, and under extraordinary circumstances the proposed system of changing direction may still be made applicable by moving a little slower than usual at first starting, or by placing one division in column in rear of the flank, which would give sufficient room and get over the difficulty at once.

The squadron intervals will give quite space enough for a change of direction, taking the place of what is now called advancing or retiring in column of threes or divisions from the flanks of squadrons.

Passage in column of divisions from a flank along the rear.

With reference to the passage in column of divisions from the flank in succession by the rear, if we take A and B to represent two contiguous divisions in line, or units of the future column, A the one towards the flank, from which the movement is to commence, and B the next one to it in line, the relative positions in which they are to arrive at the same moment of time are their correct positions in column, A a full distance in front of B.

Fig. 6.



We shall now consider the distances they have respectively to pass over to reach such positions.

A has :

1. To wheel the semicircle to the rear.
2. To pass to the rear to clear the serrefile rank.
3. To wheel into column.
4. To move over the double distance, which is equal to the diameter of the semicircle first wheeled.

B. has :

1. To wheel the semicircle to the rear.
2. To pass to the rear to clear the serrefile rank.
3. To wheel into column.

When they have each respectively passed over these distances, they will be in their correct relative positions in column. The difference between the two distances is the diameter of the semicircle first wheeled; this therefore is the start which A must have of B, in order that they may arrive in their relative positions in column, at the proper time. The diameter is to the semicircle in round numbers as 2 to 3, therefore the equivalent to the diameter on the semicircular arc, when the wheeling pace is the rate of manœuvre, will be two-thirds of such arc.

The remaining third of the semicircle will evidently be equal to half the diameter, which is equal to the front of the division, or exactly the squadron interval.

Rule for timing the movement.

The rule for timing the movement will therefore be as follows:—The flank divisions of squadrons, on the flanks towards the hand from which the movement is commenced, should get the word 'March,' which puts them in motion, when the preceding division gets the word 'Forward' upon completing the wheel of the semicircle. All the other divisions should get the word 'March' when the preceding division has completed two-thirds of the semicircular arc. This can be easily judged, as the wheeling body is so small. But correct timing of the word of command will be of little use, unless the wheel is also made at the correct rate of manœuvre; if the wheeling flank rushes round upon the word 'March,' the column distance will be lost, and unless this tendency is checked at once, the whole movement will be thrown out. In this movement also, the wheeling pace should equal the rate of manœuvre. It is a movement of retreat, and it is highly important that as such it should be performed with the utmost steadiness and precision. The radius of the arc wheeled being, as in the case of wheeling from column into line, very small, the second or so of time gained by an acceleration of the wheeling pace would hardly be appreciated, and would never compensate for the hurry and unsteadiness which it would probably produce in the movement.

CHAPTER IV.

THE MARCH IN COLUMN: PRESENT SYSTEMS.

THE next matter to be dealt with, according to the division of the subject which we have adopted, is the march in column.

Change of direction in open column.

The first article we find under this head, in the 'Ordonnance sur l'Exercice et les Évolutions de la Cavalerie,' is the change of direction in open column, *changer la direction en colonne avec distance*, and this is the all-important consideration in the column movement; it is in fact the turning point of the whole matter.

If we cannot hit upon some means of making our changes of direction smoothly and steadily, at a quick pace, as well as at a slow pace, the march in column will become disorderly and unsteady. In all manœuvres and marches, changes of direction are of necessity frequent; we cannot march always in a straight line, and if every change of direction is to produce excitement and unsteadiness amongst the horses, loss of column distances, and consequent variation of pace throughout the column, the rushing forward of one portion of the column to make up what they have lost in the wheel, and the hanging back of another portion to regain their proper distance, with other evils too numerous to mention, then indeed all our chance of quick and steady movements is at an end.

Our formations in line will be affected by our disorderly movement in column, and the wheel in column, which ought to be habitually easy and mechanical, will be difficult and productive of confusion.

We shall now consider the change of direction as it is at present carried out.

Modes of performing this movement in our service.

We have two ways of performing this movement. The first by means of the halted pivot, and the second by means of the moveable pivot.

The last divides itself into two branches, the moveable pivot to the pivot hand, and the moveable pivot to the reverse hand.

Wheel on the halted pivot in open column.

First we will consider the halted pivot.

The principle of the halted pivot when applied to column movement is as follows:—Each portion of the column increases the pace on the wheeling flank during the change of direction, so as to complete a given arc of the circle in sufficient time to get out of the way of the succeeding portion of the column, by the time that the latter arrives at the common wheeling point.

The flank man on the wheeling hand regulates the wheeling pace, looks inwards towards the pivot, and eases off at a tangent, or closes in the circle, according as he observes a tendency to crowd or to open out in the ranks during the wheel.

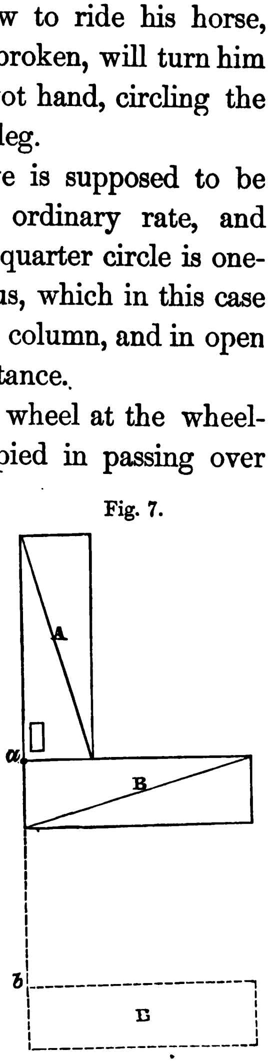
The remainder of the wheeling body look to the guide on the wheeling flank, and by him regulate their pace, gradually diminishing it from the wheeling to the standing flank.

The pivot man, if he knows how to ride his horse, and his horse happens to be well broken, will turn him on the fore foot towards the pivot hand, circling the croup round by a pressure of the leg.

Our wheeling rate on the move is supposed to be about one-half faster than the ordinary rate, and practically speaking the arc of the quarter circle is one-and-a-half the length of the radius, which in this case is the whole extent of front of the column, and in open column is equal to the column distance.

Hence the time occupied in the wheel at the wheeling pace is equal to the time occupied in passing over the column distance at the rate of manœuvre.

Fig. 7.



This arrangement as to pace would do very well if we had no troop leaders, and no rear ranks to provide for. But as we have, something must be done to prevent one getting into the way of the other at the wheeling point.

We will now briefly examine the matter with reference to this particular point.

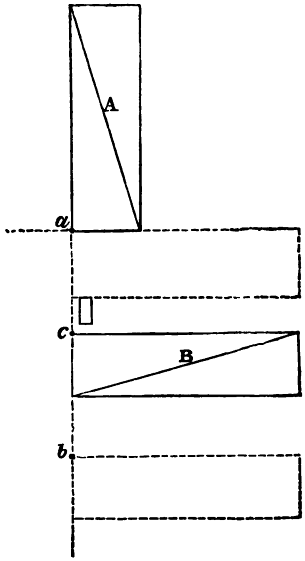
Suppose A and B to represent two troops of a squadron forming a portion of an open column of troops, A being the leading troop, and B the rearmost troop of the squadron which is about to change direction.

If A moves only half as fast again as B, and consequently completes the quarter circle wheel, during the time B is passing over the column distance *b a*, the consequence is that the rear rank of A is in the way of B, the further movement of which is impeded till A moves forward on the new line.

Besides the troop leader is crushed in between the two ranks, or else he must relinquish his post as leader at the most critical time, in order to get out of the way and provide for his own safety.

But if A wheels at such a pace as to complete the

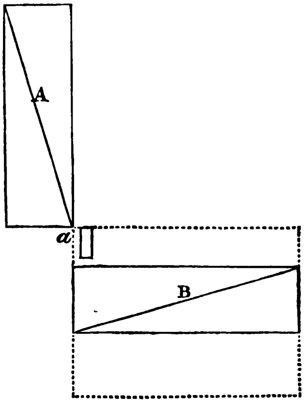
Fig. 8.



quarter circle when B has reached a point *c*, at a sufficient distance from the wheeling point *a*, the result is, that A and B, subsequently moving at the same rate on the direct lines, will successively assume the relative positions indicated in figs. 9 and 10.

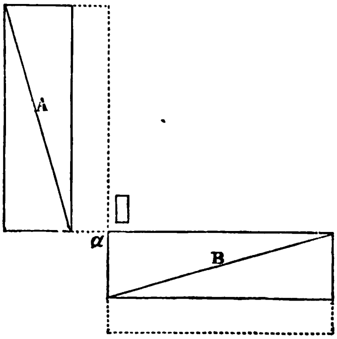
First, A having moved forward a distance equal to the depth of ranks on the new line, B will have moved in the same time a similar distance on the original line; which brings the head of the troop leader's horse up to the wheeling point, with clear ground in front, on to which he can move without losing his position as leader.

Fig. 9.



Secondly, B moves on to the wheeling point, which it can now do without impediment; and while it is doing so, A moves forward an equal distance on the new line, and at the moment when B is on the point of commencing the wheel, the two troops will assume the position here indicated. Under these circumstances, there is no impediment, at the wheeling point, to the free movement of both troops. But to accomplish this, A must move more than half as fast again

Fig. 10.



as the ordinary rate, and we shall now see at what rate it must move.

We have seen that it must move over the quarter circle in the same time which B takes to move at the ordinary rate from *b* to *c* (*vide* fig. 8). Now *b c* is evidently the column distance, or, in other words, the extent of front, less the depth of ranks and the distance occupied by the troop leader. The depth of ranks is 20 feet, and the troop leader occupies his own horse's length (8 feet), and the half horse's length (4 feet), between him and the front of his troop, that is to say, he occupies 12 feet. These distances together amount to 32 feet, which we may call 11 yards.

Suppose then, for example, we take two troops of 24 files, moving at the gallop of 11 miles an hour. The column distance is here 24 yards; if we take from this the 11 yards already mentioned, the distance *b c* remains equal to 13 yards. Now A must wheel the quarter circle of 36 yards, while B advances this 13 yards, therefore the wheeling pace must be to the ordinary pace as 36 to 13. This compels the wheeling pace to be over 30 miles an hour,* when the gallop is at the rate of 11 miles per hour.

Unsteadiness and disorder caused by this movement.

If this rate of 30 miles an hour is not kept up on the wheel something must be done to compensate for the want of speed on the arc of the circle, or else, as has been shown, the troops will run into each other at the wheeling point; and this compensation consists of checking at one moment, and pushing forward at another moment. The result is as follows:—B, seeing that the wheeling point will not be clear in time, checks its pace to give A time to move off before its arrival, the consequence of which is, that all the ranks of the column in rear of B must either alter their pace also, or lose their distances and run over B and each other. The troop following B, being the leading troop of a squadron, and having the squadron interval in its favour, will not probably feel the difficulty to the same extent as B, and may move on to the wheeling point without impediment, or checking its pace. But for the next succeeding troop in the column, which is the rear troop of a squadron, the same causes will come into operation which impeded the movements of B with the same results, causing a second checking of pace and consequent shake in the column.

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* Distance to be passed over by B=13 yards; ditto by A=36 yards; pace of manœuvre (B's pace) = 11 miles per hour.
Hence 13 : 36 : : 11 : 30·4.

After passing the wheeling point, A will move forward in the new direction at the rate of 11 miles an hour, or a little faster or slower, as the case may be. B having also completed its wheel will most likely find that it has not got its correct interval, and will in consequence slacken or increase its pace as the case may require.

The leading troop of the second squadron having had the advantage of the squadron interval, and having in consequence completed its wheel in turn, without check or impediment, will find that it has only escaped one difficulty to fall into another; for, having already taken advantage of its squadron interval at the wheeling point, it will have no squadron interval after the wheel, and hence another check and alteration of pace must ensue.

It is unnecessary to pursue the analysis farther; enough has been said to show that there are inherent in the principle itself causes which must produce unsteadiness. Even if the requisite pace on the wheel could be attained, the mere fact of its being necessary to excite the horses by putting them to great speed, obliging them to move at one movement on the arc of the circle as fast as they can lay legs to the ground, and the next moment checking them up to a comparatively slow pace, would be quite enough to produce unsteadiness and disorder in the column. Who has not observed the difficulties attendant upon a gallop past in open column—where, as if in order to increase the difficulties, the troop leader changes his flank just at the critical moment when the column comes on to the passing line?

It would be very easy to calculate the rate of wheeling pace for the trot and walk as well as for the gallop, but it would be practically useless: no rule in the matter could be established, because the 11 yards already spoken of (being the distance allowed for the depth of ranks and the troop leader) enters into the calculation as a constant quantity, while the other quantities, namely the pace and extent of front, are variable, so that no constant ratio could exist.

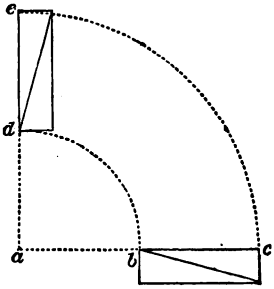
Old customs and usages are in general worthy of respect, and under many circumstances an adherence to them is to be commended; but it would be a very good thing if the halted pivot, as a mode of changing direction in open column of less extent of front than squadrons, were struck out of our code of regulations.

Wheel on the moveable pivot to the pivot hand in open column.

We next come to the wheel on the moveable pivot to the pivot hand. Here we are not troubled by troop leaders or the interference of ranks as in the former case; for, as the guides on the pivot flank retain the ordinary rate of pace whether on the wheel or the direct line, the relative distance of the units of the column will be preserved throughout. The only difficulty here is to regulate the movement so as not to impose too fast a pace upon the wheeling flank, or to take up too much room in wheeling.

If we take *a b*, the distance from the point *a*, about which the pivot is supposed to circle, equal to *b c* the extent of front of the wheeling body, the radius *a c* will be twice the radius *a b*; consequently the outside arc *c e*, described by the reverse flank, will be twice as long as the inner arc *b d*, described by the pivot flank.*

Fig. 11.

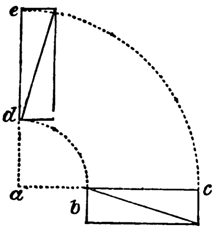


Hence it follows that the reverse flank must in this case move twice as fast as the pivot flank, which is supposed to move always at the ordinary rate. For instance, when the pivot flank is moving at the gallop of 11 miles an hour, the reverse flank must move at the rate of 22 miles an hour.

But it must be observed that, in order to render this rate sufficient, the pivot must circle round a point at a distance from it equal to the extent of front of the column, whatever that may be; or, in other words, must describe an arc equal to one and a half the extent of front of the column.

If we make *a b* equal only to half the extent of front *b c*, then *a c* is three times as long as *a b*, and consequently the outer arc *c e* is three times as long as the inner arc *b d*.

Fig. 12.



In this case the pivot flank only moves over an arc equal to three-quarters of the extent of front, but the pace on the reverse or wheeling flank will be three times the ordinary rate, so that at the gallop of manœuvre the wheeling pace must be equal to 33 miles an hour.

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* Similar arcs of circles are in the same proportion as their radii

Disadvantages of this movement at a quick pace, or where space is limited.

From these facts we arrive at the conclusion that, when moving in column at a quick pace, the adoption of this principle of changing direction either imposes a very rapid rate upon the wheeling flanks, or else requires a considerable amount of space.

When the front of the column is small, this is a good and serviceable movement, and, where plenty of space is available, it is adapted to every description of column.

Wheel on the moveable pivot to the reverse hand in open column.

We will now speak of the wheel on the moveable pivot to the reverse hand.

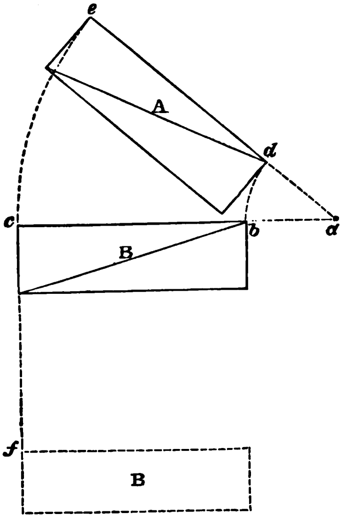
The pace on the wheeling flank being, according to regulation, the ordinary rate of manœuvre, we are here again troubled by the interference of the rear ranks, but, in consequence of the change of direction being always to the reverse hand, the troop leader will in this case be out of the way.

It will be unnecessary to take the matter of pace on the wheeling flank into consideration, as it is always at the rate of manœuvre; but we will analyse briefly this movement in its other bearings.

Take A and B (fig. 13) to represent two adjacent portions (or units) of a column, performing a change of direction on the moveable pivot to the reverse hand.

As both are moving at the same pace, when B, the rearmost of the two, has passed over the column distance *f c*, and arrived at the point *c*, where A commenced the wheel, the outer or wheeling flank of A will at the same moment have completed on the arc of the larger circle a distance *c e*, equal to *f c* the column distance. Therefore, we have to provide that, when B reaches the point *c*, where the change should commence, the inner flank, or flank wheeled to, of A shall be out of the way, leaving B free to commence its movement in turn upon the arc of the circle.

Fig. 13.



Failing this there will be a stop or check, and all the evil consequences attending the wheel on a halted pivot will follow.

The problem to be solved is therefore as follows:—

What should be the length of the radius *a e*? or, in other words, at what distance from a central point *a* should the wheeling flank of A circle round, so that when it has completed on the larger arc a distance *c e*, equal to *f c* the column distance, the inner flank or flank wheeled to of A, shall have completed on the inner or lesser arc a distance *b d*, equal to the depth of ranks? Or, in fewer words, we may state the problem thus. What should be the longer radius, so that when the outer arc equals the column distance the inner arc shall equal the depth of ranks?

In open column this radius will be equal to the square of the extent of front of the column, divided by the difference between the same extent of front and the depth of ranks. The calculation of this, which is very simple, and depends upon a well-known property of proportional quantities, may be found in the Appendix.*

Analysis of instructions for this movement.

The instructions laid down in our regulations for this movement are as follows:—

'When the change is to be made to the reverse hand, the troop leader, having arrived at about the distance of the front of his troop from the point of intersection of the old and new direction, gives the word "Right (or Left) Shoulders," and the pivot gradually circles into the new direction. The rest of the troop, by giving way and decreasing the pace, having conformed to the movement, the leader, at the proper point, gives the word "Forward." It is, however, to be observed, that the distance at which the troop leader ought to give the word "Right (or Left) Shoulders," from the old direction towards the new one, must depend upon the extent of front of his troop, the degree of change to be made, and the rate of march at which the body is moving, for in proportion as each is increased, should the arc of the circle be increased also, and the operation be sooner commenced, in order that the change may be made gradually, without overshooting the line, and so completed that the intended direction may be pursued at the word "Forward."'*

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* Appendix, note 4.

The substance of this is, that the distance at which the troop leader ought to give the word 'Right (or Left) Shoulders' from the old direction towards the new one, the length of the arc of the circle, and the time of commencing the operation, all of which amount to the same thing, are dependent upon three points: 1st, the extent of front of the column; 2nd, the degree of change to be made; and, 3rd, the rate of march at which the body is moving; and that in proportion as each of these three is increased the arc of the circle must be increased also.

We will now examine these three points in order.

1. As to the extent of front. The length of the arc for any given angle or degree of change varies, as we have already shown, directly with the radius. But the radius required to get the rear rank out of the way, and consequently the length of the arc, instead of increasing as the extent of front increases, will be found to diminish rapidly as the front increases up to a certain point, and then to increase slowly as the front increases.†

For instance, when the front is only 7 files, the radius, and consequently the arc, is infinite; or, in other words, it is impossible to get the rear rank of one unit of the column clear of the succeeding rank, no matter how wide a sweep be taken, unless the leading rank increases or the succeeding rank decreases its pace.

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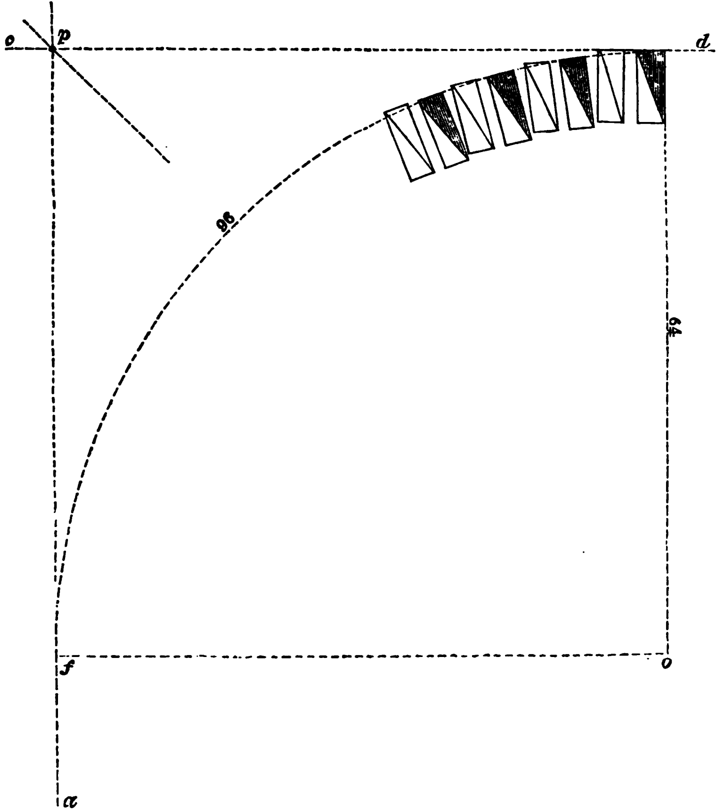
* Cavalry Regulations, p. 108.

† Appendix, note 5.

When the front consists of 8 files, the radius is 64 yards long, and the length of the arc, upon the supposition that the change is the quarter circle, one and a half the radius, that is, 96 yards.

Fig. 14.



For 9 files the radius is 40·5 yards, and the quarter circle arc 60·7 yards.

For 12 files the radius is 28·8 yards, and the quarter circle arc 43·2 yards.

For a troop of 24 files the radius is 33·8 yards, and the quarter circle arc 50·7 yards; and so on.

We find in the regulations, 'Wheels on a moveable pivot are used in most cases when the front of the column is small, or when the change of direction to be given is less than the quarter circle.'* But we see that when the front of the column is small, and the change of direction is made on the present principle, an extraordinary proportion of space and time, with reference to the extent of front, is required to effect the movement as laid down in the regulations.

Impossibility of laying down rules for this movement.

There can be no practical utility in going farther with this rather complicated and intricate matter. Enough has been said to show that the radius or length of the arc to be wheeled, or the distance from the point of intersection of the old and new directions, or whatever may be indicated as a guide to the responsible conductor of the wheel, to enable him to perform the change of direction correctly, does not increase regularly as the extent of front increases; and, moreover, that the variation is of such a nature with regard to the extent of front, that no rules practically useful can be deduced. Hence we arrive at the conclusion that our regulations err in laying down the law that, in proportion as the extent of front increases, this radius or guide, whatever it be, increases also.

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* Cavalry Regulations, p. 107.

The second point which, according to our regulations, is to guide the troop leader in timing his movement, is the degree of change to be made. With any given extent of front, which implies by our regulations with any given constant radius, the arc to be wheeled increases with the angle or degree of change to be made, and consequently[*] the distance between the point of intersection of the old and new directions and the point where the wheel should commence increases also. The terms of this second portion of the instruction are therefore quite correct, and might be practically useful if our extent of front in open column were constant, as it is in the French service. But when we come to combine the variation of time and distance on this account with that dependent upon the extent of front, which particularly affects small columns, a complication arises which we had better not lose time in trying to unravel.

The third point which by our regulations is to affect the arrangements in this movement, is the rate of march at which the body is moving. In the change to the pivot hand, the faster the pace the greater should be the circuit taken; but this is in order to avoid imposing too fast a rate upon the wheeling flank. In the present case, however, the pace of the wheeling flank must not, according to regulation, exceed 11 miles an hour, and the sweep or circuit rendered necessary for the wheeling flank, from the causes already mentioned, irrespective of the rate of pace, should be quite sufficient to ensure against all chance of 'overshooting the line,' when moving at a rate not exceeding 11 miles per hour.

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[*] Appendix, note 6.

This concludes the analysis of this movement in open column, as performed in our service.

Wheel on the moveable pivot in other than open column.

With regard to other columns, it will be found that, in changing direction on this principle, the wheel should be made by the wheeling flank in files, sections of threes, and threes, upon the following radii, 11, 22, and 55 feet respectively, and for close column of squadrons, the length of the radius should be two and two-fifths, ($\frac{12}{5}$) of the extent of front, and the length of the arc to be passed over by the wheeling flank, when the change is the quarter circle, three times, ($\frac{15}{5}$) the extent of front.

French mode of changing direction in open column.

We will now proceed to the mode adopted in the French service of changing direction when moving in column. The principle of the movement is explained as follows:—

'La conversion à pivot mouvant s'emploie dans les changements de direction successifs en colonne; dans cette conversion, le pivot mouvant a pour objet de dégager par degrés le terrain où commence le mouvement, et de l'abandonner en avançant dans la nouvelle direction.

'Le conducteur de l'aile marchante doit augmenter son allure et décrire son arc de cercle de manière à ne point faire ouvrir ni serrer les files; le pivot décrit un arc de cercle de cinq pas en ralentissant l'allure dans chaque rang; les cavaliers placés depuis le milieu du rayon de la conversion jusqu'à l'aile marchante augmentent progressivement l'allure, de manière que celui du milieu conserve l'allure à laquelle il marchait précédemment; les cavaliers placés depuis le milieu du rayon jusqu'au pivot ralentissent dans la même progression. A la fin d'une conversion à pivot mouvant, la portion de la troupe qui a augmenté son allure doit la diminuer, et celle qui l'a diminuée doit l'augmenter. Tous les cavaliers redressent leurs chevaux; l'aile marchante et le pivot reprennent l'allure à laquelle on marchait précédemment.

'Dans la conversion à pivot mouvant, on ne doit pas entendre par le milieu du rayon de conversion le centre de la troupe qui converse, mais le milieu de la ligne qui, partant de l'aile marchante, irait aboutir au point autour duquel le pivot décrit son arc de cercle. Ainsi, dans un peloton de 12 files, le milieu du rayon de la conversion est entre la 4^e et la 5^e file; c'est donc la 5^e file du côté du pivot qui doit conserver l'allure à laquelle on marchait précédemment.'

Some preceding paragraphs are omitted, in which the general principles of the wheel, both on the halted and moveable pivot, are clearly and distinctly explained, but the passage quoted is sufficiently plain and explicit, as far as regards the wheel on the moveable pivot.

Principal features of the wheel on the moveable pivot.

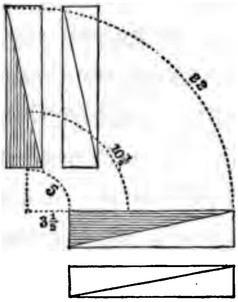
The principal features to be observed in this mode of wheeling are—

1. The pivot describes an arc of 5 mètres; or, in

other words, circles round a point at a distance of 3⅓ mètres.

2. The point regulating the pace is supposed to move on an arc, at a distance from the central point round which the conversion is made, equal to half the radius of the outer or larger circle.

Fig. 15.



In practice, the fifth file from the pivot is taken to represent this regulating point. This file is supposed to preserve the ordinary rate of march throughout the wheel, and the length of the arc over which this centre point is supposed to travel is taken at 10½ mètres.*

In the first place it will be evident, from what has been already shown in speaking of our own moveable pivot to the pivot hand, that, the regulating point for the pace being in the centre of the radius of the outer arc, the pace on the wheeling flank will be twice the ordinary rate of pace.

The rate for the gallop is 300 paces (300 mètres) per minute, which is equivalent to our 11 miles an hour; consequently the rate at the wheeling flank will not exceed 22 miles an hour.

According to our principle of wheeling just alluded to, in order to effect a change of direction under these

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* Appendix, note 7.

circumstances, we should require a space equal to a segment of a circle, with a radius twice the length of the extent of front; but in consequence of the regulating point being moved from the flank towards the centre of the wheeling body, a proportionate amount of space is saved, and at the same time no faster rate is required on the outer arc.

With regard to the five files towards the pivot hand, the fifth file moves at the ordinary rate, while the others gradually decrease the pace towards the pivot. It would at first appear that the movement of these five files should be governed by the rules belonging to our wheel on the moveable pivot to the reverse hand; but, in consequence of the column distance being equal to 12 mètres, while the length of the arc to be passed by the fifth file, moving at the ordinary rate, is only about 10½ mètres, the leading peloton will have completed the quarter circle, and will have advanced a mètre and a half on the new line, upon the arrival of the succeeding peloton at the point where the wheel should commence.

Advantages of this movement.

This movement is therefore free from the difficulties arising from the interference of ranks, which encumber the change to the reverse hand in open column according to our principle.

Proposed change in the mode of guiding the wheel.

In all instructions given in this matter of the moveable pivot, the directions have reference either to the distance from the point of intersection of the old and new lines of movement, or else to the length of the arc to be passed over during the change from one line to the other. It would appear to be a more simple proceeding, and one less liable to error, if we were to take on the ground at some given distance, a central point, and circle round it, always maintaining the same distance from it until the change required was completed, and the word given to move forward. The habit of selecting points on the ground, and using them as guides in movement, is supposed to be acquired by conductors in the advance. The habit of judging correctly short distances, such as 10, 20, 30, or 40 yards, is quickly and easily acquired, and is most useful in military sketching, and for other purposes. The eye will detect immediately any increase or diminution of the distance first assumed during the wheel, while to judge the length of the arc is more difficult, and gives more chance of error.

In the French service the following aids and instructions are given in this matter with reference to the successive wheels in column of pelotons (12 files).

'Dans ce changement de direction en marchant, le guide principal de droite au commandement "Tête de colonne à gauche," se porte rapidement en avant du côté du pivot, et se place de manière à marquer avec la tête de son cheval le milieu de l'arc de cercle que le pivot doit parcourir.

'Tous les pelotons commencent leur conversion à 2½ pas (2½ mètres) avant d'arriver à hauteur de la tête du cheval du guide principal de droite, ce qui empêche la colonne de se jeter en dehors; le sous-officier reprend sa place, quand le dernier peloton a achevé sa conversion.

Immédiatement après avoir changé de direction, le capitaine commandant donne un nouveau point de direction au guide du premier peloton.'

The above is with reference to the squadron *en colonne avec distance*, the peloton being the unit, and the front being constant to 12 files, not variable as with us.

The rules given are intelligible and easy of application in practice; in fact, the movement amounts to nothing more than circling round the marker's horse, commencing at a certain short distance, soon learnt in practice.

We are farther told that 'la conservation exacte des distances, après les changements de direction, tient à l'égalité que les pelotons observent dans l'augmentation de l'allure préscrite aux ailes marchantes. Il est donc important que le peloton qui est en tête ne tourne ni trop vivement ni trop lentement, et que chacun règle le degré de vitesse de sa conversion sur celui qui le précède.

'Quand le changement de direction s'exécute du côté opposé au guide, le pivot en tient lieu pendant la durée de la conversion.'

In the wheel on this principle of the squadron consisting of four pelotons in line, the sixth file of the second peloton towards the pivot hand is taken as the representative of the centre of the radius of conversion, the pivot describing an arc of 20 paces.*

The pace on the wheeling flank, as in the case

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* Appendix, note 8.

CHAPTER V.

THE MARCH IN COLUMN: PROPOSED ALTERATIONS.

Two kinds of column only.

IN the consideration of the march in column as proposed, we have only two descriptions of open column to deal with.

1. *Column of threes.* This column, when in movement, loses the characteristic which places it under the head of the open column, and while extended and in motion belongs more properly to the column of route. But it may be considered the means of transition from one description of column to the other; and as far as regards the covering when moving forward in the direct line, and the mode of changing direction in column, it is dependent upon the principles applicable to the open column in general.

2. *The column of divisions.* The front of this column is equal to the fourth part of the squadron or unit in line, the squadron in column consisting of four ranks.

Rules applicable to both columns.

The following rules apply to both these columns:— The regulating point for both pace and covering to be in the centre of the column ranks, whether moving on the direct line or during the change of direction. In moving forward on the direct line, the centre man of threes will be responsible for the covering and distance in column of threes, and the division leader in column of divisions. The change of direction in column to be made on the principle of the moveable pivot, the ranks of the column in succession circling round a point at a certain short distance from the inner or pivot flank. As the regulating point as to pace is placed in the centre of each rank of the column, it is evident that, with reference to the half of the rank towards the wheeling or outer flank, the principle is applicable which belongs to the wheel on the moveable pivot, when the regulating point for pace is on the inner flank; and with reference to the half of the rank towards the inner or pivot flank, the principle is applicable which belongs to the wheel on the moveable pivot when the regulating point for pace is on the outer or wheeling flank.

We have already shown that, in the first case, the rate of pace on the outer or wheeling flank is equal to the distance of the wheeling point, round which the ranks of the column circle, from the outer or wheeling flank, divided by the distance from the wheeling point to the inner or pivot flank, and multiplied by the rate of manœuvre; and that in the second case, in order to prevent a collision of the ranks of the column, the distance from the wheeling point to the outer flank should equal the column distance measured from front to front, divided by the column distance measured from head to croup, and multiplied by the extent of front of the column.

As the central point by which the column is led is the inner flank of one half of the column rank, and the outer flank of the other half, the above rules, when applied together to a column led by the centre, become as follows:—The pace on the outer or wheeling flank will equal the distance from the wheeling point to the outer flank, divided by the distance from the wheeling point to the central point, multiplied by the rate of manœuvre; and in order to prevent a collision of the ranks, the distance from the wheeling point to the central point must equal the column distance measured from front to front, divided by the column distance measured between ranks from head to croup, multiplied by the distance from the central point to the flank, or half the front of the column.

The arrangement for changing direction in open column, when the regulating point is the centre, should therefore be tested by the application of both these principles. So that, on the one hand, the pace on the wheeling flank shall not be excessive, and that, on the other hand, there shall be no possibility of a collision of the ranks of the column during the change, but that there shall be full room and space for executing the movement.

Column of threes. Extension when in movement.

We will now speak of these columns separately, and first of the column of threes. The extension of the column of threes, when in movement and at the full column distance of 11 feet, is evidently two-ninths of the depth of the column of threes at wheeling distance, when the column distance is 9 feet. The depth of the column of threes at wheeling distance may be taken equal to the extent of front, and the extension of two-ninths is so nearly the same as the squadron interval of one-fourth that the closing up of each squadron, upon the halt, previous to wheeling into line, just opens the squadron interval, on the supposition that the head of each squadron has been closed up to the rear of the preceding squadron during the movement.

In open ground, when there is sufficient room on the flanks of the column, when the direction in which the column is eventually to front or form is supposed to be known, and the wheel into line is likely to be immediately required, the division leaders and serrefiles can take their posts on the flanks, and the closing up of each squadron from the full distance to the wheeling distance will be sufficient to open the interval, and place the whole column in a position to wheel forward into line.

Officers and serrefiles to enter the column line in three ranks.

But in the usual column of route on the march the officers and serrefiles must necessarily enter the column line for two reasons.

In the first place the front of the column is generally diminished, because there is not room for a more extended front, and therefore an available space on the flanks of the column during the march cannot be calculated upon; and in the second place, until it is known to which flank a formation may be required, it is necessary that the leaders and serrefiles should be in a position to move to either flank, and take their proper posts in line; and this will be the case if they occupy positions in front and rear of their respective squadrons.

This entrance of the leaders and serrefiles into the column will entail a further extension of the depth of the column, and therefore, previous to a general formation to a flank by the wheel into line from threes, each squadron in succession must close up this interval before halting; the leaders and serrefiles moving out to the flanks immediately upon its being indicated by signal to which hand the wheel into line is to be made, and thus leaving open the interval necessary for the closing up of the squadrons.

It is proposed to form the leaders and serrefiles in three ranks, two in front and one in rear of the squadron.

The two ranks in front to consist of—

1st rank—squadron leader, and leader of the first division in the column.

2nd rank—leader of the second division in the column, the squadron marker, and trumpeter.

The rank in rear to consist of the third and fourth division leaders and the squadron serrefile.

The introduction of these three additional ranks into the column will produce an extension about equal to the distance to be closed up by each squadron from extended order to wheeling distance; therefore the head of each squadron in succession should continue to move forward, until the last rank of the preceding squadron halts upon the completion of the close up to wheeling distance; the second squadron then halts, and closes up in its turn; and so on throughout the column. This will just leave the correct interval between squadrons upon the wheel forward into line.

Dressing and covering in column.

The place of the centre file of both flank threes of the squadron will be occupied by non-commissioned officers. The dressing is to the centre in each rank of the column, and the centre men of threes are responsible for the column distance and covering.

Mode of changing direction.

The change of direction is next to be considered. The marker moves forward and places himself on the pivot flank, so as to mark with his horse's head the centre of the arc to be wheeled. The leading rank of the column commences the wheel, at a distance about equal to the extent of front of the column, measured from centre to centre of the flank files (about 2 yards), from the head of the marker's horse, and simply circles round him till the change of direction is completed; all the remaining ranks of the column follow in succession, regulating their dressing and pace by the centres of threes.

Test of this movement for pace on the wheeling flank.

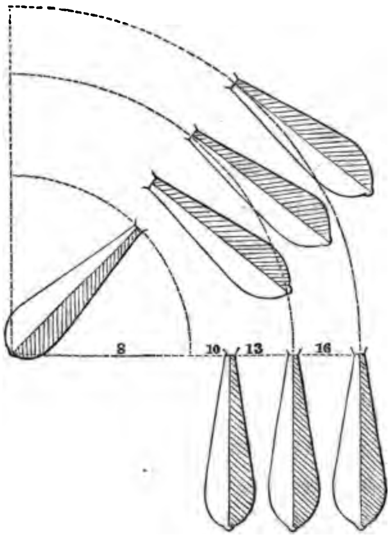
We shall now examine how far this arrangement is in accordance with the requirements of the principles just spoken of.

As the ranks of the column in succession circle round the marker's horse, the radius of the inner or lesser arc will be 8 feet, the length of the horse.

According to the conventional measurements, the distance from the stirrup of the inner flank man to the centre line, upon which his horse is supposed to move, is 1 foot 3 inches. Taking this distance as 2 feet, in order to allow a free movement round the marker's horse, we have the distance from the line of movement of the inner flank men of threes to the wheeling point equal to 10 feet.

Three feet added to this gives the distance from the wheeling point to the line of movement of the centre men of threes equal to 13 feet; and 3 feet more added to the last distance will give the distance from the wheeling point to the line of movement of the outer flank men of threes equal to 16 feet.

Fig. 17.



In the first place, therefore, according to the principles established, the pace on the outer or wheeling flank will be equal to $\frac{16}{13}$ of the rate of manœuvre maintained during the change by the central regulating point.

This will give the pace on the wheeling flank when the column is moving at the walk equal to only 5 miles and 61 yards per hour.

These wheeling rates being the same multiple of the different rates of manœuvre, will of course be in the same proportion as the rates themselves: therefore, when the column is moving at the trot, the wheeling rate will be double, and when at the gallop, treble the rate just mentioned; that is, at the trot, 10 miles 122 yards, and at the gallop 15 miles 183 yards per hour.

Only very moderate pace required. Advantages of this.

These rates are so very moderate that, with common attention, the change of direction ought to be effected with perfect steadiness and smoothness, particularly as the centres of threes, which do not change the pace during the wheel, remain as a guide to the flank men, when the original pace is resumed after the wheel.

In the frequent changes and continual windings to which the column of threes is likely to be subjected, it is very important that the rates on the flanks should differ so slightly from the rate of manœuvre as to produce no unsteadiness or hurry during the wheel of each rank of the column.

Test of the movement for avoiding collision of ranks.

In the second place, to prevent a collision of the ranks of the column, the distance from the wheeling point to the central point must equal the column distance, measured from front to front, divided by the column distance measured between ranks from head to croup, multiplied by the distance from the central point to the flank, or half the front of the column.

In the present case the column distance from head to croup, and the distance from the central point to the flank, are the same, each being 3 feet; therefore the distance from the wheeling point to the central point, which is necessary to prevent a collision of the ranks during the change, must not be less than the column distance measured from front to front, which is 11 feet.

More than sufficient space available. Advantages of this.

According to the proposed arrangement this distance is 13 feet: there will, therefore, be no collision of the ranks of the column in wheeling, but each rank in turn will leave room for the succeeding rank.

The wider the circle taken in the wheel, the more free will be the movement, and the slower will be the pace on the wheeling flank; therefore, when there is plenty of room, it may be taken advantage of slightly to enlarge the circle. This might be left to the judgment of the non-commissioned officer in the centre of the leading rank of the column.

When circumstances do not admit of the marker being placed at the point where the direction changes, the non-commissioned officer in the centre of the leading rank must judge his distance, which a very little practice will enable him to do correctly, and the remaining centres of threes must follow in his track.

From this we may proceed to speak of the column of divisions. **Column of divisions.**

A non-commissioned officer to be on the right of the third rank of threes from the right of each division, when the division consists of twelve files; and in the centre of the second rank from the right of each division, when the division consists of nine files. **Detail of the column.**

The duty of these non-commissioned officers will be to follow the division leader, keeping a distance of one yard from his horse's croup.

In column of divisions of nine files, the non-commissioned officer must follow directly in rear of the division leader, and in column of divisions of twelve files, a little to his left rear.

The full distance of one yard should be strictly kept at all paces; this will allow the leader to move freely, and keep the correct distance from the column rank in front. If the rank presses too close upon the leader, his horse will become unsteady and excited, and he will not be able to lead steadily. It is a very common practice to press upon or override the leader in line or column, particularly at the fast paces, and it is most productive of unsteadiness; for if the leader is pressed upon, the maintenance of the column distance is no longer under his control.

The two flank divisions are led by officers; the two centre divisions by non-commissioned officers.

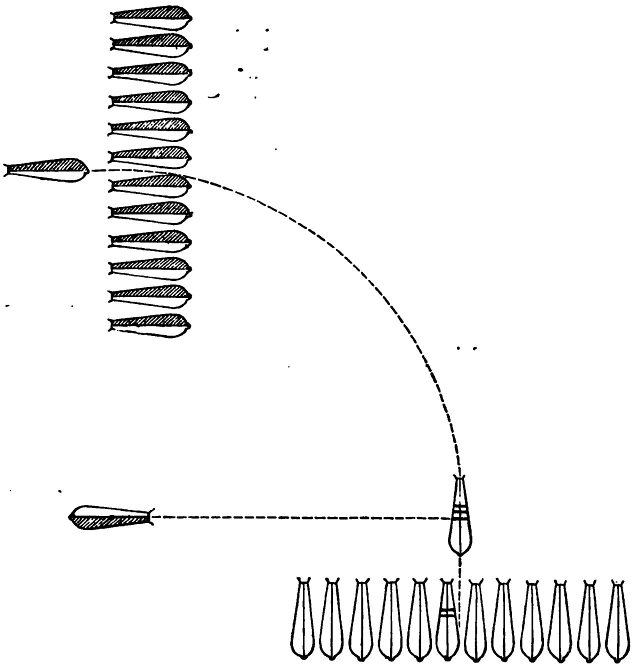
The leaders are responsible for both covering and distance.

The point of covering is the centre point of the rank **Covering** and distance. Advantages of this system.

in front, and the distance is judged from the croups of the horses of the rank in front to the head of the leader's horse.

Theoretically it is quite correct that the distance should be taken from front to front, but in practice it is difficult to do so, particularly when the column ranks are double, as in our present system, and practically the distance is generally judged from the rear rank.

Fig. 18.



The principal objection to judging the distance from head to croup is, that any opening out or closing up of the rear ranks to the front ranks would throw out the distance and covering. But in the system now proposed, the column ranks being single instead of double, there can be no opening out of ranks and closing up again to derange the distance when judged from head to croup.

The column ranks are so small, consisting of from nine to twelve files, that there can be no difficulty in judging the centre point, and keeping the line of covering of the leaders. It is difficult to keep the covering of a particular file when the pace is quick; and even when the covering is taken close to the pivot flank, crowding or extension of the files in front may throw the covering out when this principle is adopted.

In infantry movements, the distance may be more easily judged from front to front, and the covering of a particular file maintained, for there the ranks are not so deep, and the pace is slower. But in cavalry movement, to attain an approximation to correct covering by means applicable to rapid as well as to slow movement, is better than a more theoretically exact arrangement, which may be disturbed by quick movement or unsteadiness of the horses.

In cavalry movements, the preservation of the correct column distances is more important than the covering. The consequence of a slight error in the line of covering in open column would be that, upon the wheel forward to line, the ranks of the column would be in a direct échelon at a very short distance instead of in line, and a very slight temporary alteration of pace would rectify the error if the distances had been correctly preserved; in fact, to produce any considerable error in the alignment upon the wheel into line, the error in covering in column must have been considerable. But an error in the distance renders an incline movement necessary to close the intervals after the wheel into line. The effects of this error are communicated from point to point, and may derange and shake the whole line, if the wheel forward from column is followed by an advance.

The squadron can be wheeled into column of divisions from line, and the leaders, having placed their horses square and at the correct distance in front of their own rank, should with the eye measure the distance from their own horses' heads to the column rank in front. There being only one description of column in which the leaders are responsible for the distance, which latter, consequently, is always the same, there ought not to be any difficulty in recollecting the distance and keeping it correctly at all paces.

The ranks being single, the depth never alters, and therefore in a column of single ranks the preservation of the distance ought to be perfectly correct.

Advantages of having only this column besides column of threes.

Having besides the column of threes only one description of column, the number of movements to be learnt is lessened, and for the sake of simplicity it is most desirable that the movements should be as few as possible.

For parade movements, column of troops or half squadrons may be better; but considering the impediments to be often met with on the ground which cavalry may have to work over, as well as the frequent change of direction and windings of the column which may be required, a small frontage is better adapted for service.

Advantages of column of divisions over column of threes.

The column of divisions has three advantages over the column of threes.

1. Each of the units of the column is under a leader.

2. No closing up is required previous to a wheel into line.

3. Sufficient room is left between the ranks of the column for the squadron leader to change from one flank to the other if necessary.

According to the system proposed the division leader is never required to change his pace, even temporarily, either during the change of direction of the column or at any other time, and as he has only one amount of distance to bear in mind, and as the ranks are single, and therefore there is no opening or closing up of ranks to throw him out in distance or covering, a very little attention on his part, if he is not pressed upon by his own rank, and if his horse is even tolerably tractable, ought to insure correct distance and covering.

Mode of changing direction.

The next point and the most important is the change of direction in column.

Here, as on all other occasions, the centre is the regulating point in each division during the wheel, both as to leading and pace.

The leader preserves the same rate during the whee as when moving on the direct line, as also does the non-commissioned officer following him in the centre of the division. The rest of the division adapt their pace, during the second or so that the wheel lasts, to the movement of this regulating point.

Test for pace on wheeling flank.

It would be well that upon all ordinary occasions, and at all paces, the distance of this centre regulating point from the wheeling point during the change of direction should equal the extent of front of the column, in which case the distance from the inner flank to the wheeling point would equal half the extent of front, that is from 4½ to 6 yards, according as the division consists of 9 or 12 files.

This places the regulating point for pace at a distance from the wheeling point equal to two-thirds of the whole distance from such point to the outer or wheeling flank.

Moderate pace, and for short time only, required.

Therefore the pace on the wheeling flank will always be once and a half the rate of manœuvre.

When the column is moving at the walk, the wheeling rate will be less than the trot of manœuvre, being only 6 miles 240 yards per hour, and this will have to be kept up on the wheeling flank for only nine seconds.

When the column is moving at the trot, the wheeling rate will be double the above, or 12 miles 480 yards per hour, which is just the rate of the gallop of manœuvre, and will have to be kept up for four and a half seconds.

When the column is moving at the gallop, the wheeling pace will be three times the first rate, 18 miles

720 yards per hour, to be kept up on the wheeling flank for only three seconds.

At this last rate a horse will take more than 4 yards in a stride, therefore about six strides of the horse on the wheeling flank will complete the wheel.

This is another advantage of a small frontage in column, that it is necessary to keep up the increased pace on the wheeling flank for only a short time.

And when we consider what a very short space of time three seconds is, it will be admitted that keeping up the rate mentioned for that time ought not to distress the horses or produce unsteadiness, more particularly as the central or regulating point, which ought never to alter its rate, will be a sure guide when the rate of manœuvre is to be resumed by the other files in the division, as soon as, the change having been effected, the movement is again upon the direct line.

Under the proposed arrangement, therefore, the pace on the wheeling flank will be so moderate as to admit of perfect steadiness of movement during the change of direction at all paces.

Test for avoiding collision of ranks.

We shall now apply the remaining test to this mode of wheeling, which requires that, in order to prevent a collision of the ranks of the column during the wheel, the column distance measured from front to front, divided by the column distance measured from head to croup, and multiplied by the distance from the central point to the flank, or half the front of the column, should equal the distance from the central point to the wheeling point. According to the proposed arrangement, the distance from the central point to the wheeling point is equal to twice the distance from the central point to the flank. It is evident, therefore, that if the quotient of the column distance, measured from front to front, divided by the column distance measured from head to croup, is equal to or less than 2, the conditions will be fulfilled.

Required conditions more than fulfilled.

When the divisions consist of twelve files, the column distance from front to front is 12 yards, and the distance between ranks about 9 yards, $\frac{20}{28}$ less than 2, so that the quotient here is $1\frac{1}{3}$.

When the divisions consist of nine files, the column distance from front to croup is 9 yards, and the distance between ranks about 6 yards, so that the quotient here is $1\frac{1}{2}$.

In both cases, therefore, the quotients are much less than 2, and the conditions are much more than fulfilled.

Rule for the change of direction.

The rule for changing direction according to the system proposed is as follows:—

The marker places himself facing the line of movement of the flank of the column, on the hand towards which the change of direction is to be made, at a distance from such line equal to half the extent of front of the column.

The leader, upon arriving in his own person abreast of or in line with the marker, commences to circle round a point taken about the forefeet of the marker's horse, without in the least altering his pace, and keeping always the same distance from the wheeling point, till the change is effected, when he moves forward again on the direct line, still maintaining the same pace. The leader's own distance from the wheeling point during the wheel should equal the extent of front; and he is to a certain degree assisted in judging this distance, by knowing that the distance of the inner flank from the wheeling point should equal half the extent of front.

The non-commissioned officer in the centre of the division follows the movement of the leader, keeping also the same pace (the rate of manœuvre) during the wheel.

The rest of the division regulate their pace and dressing by the central regulating point, as they also do when moving on the direct line.

We have seen that in this mode of changing direction in column, in the first place the pace on the wheeling flank will not be excessive, and in the second place, there can be no collision or interference of the ranks of the column during the wheel, but on the contrary there will be perfect freedom of action in the movement at all paces.

Summary of advantages of proposed system.

The great advantages gained by this system are—

1st. The leader and his follower never change the pace, either during the wheel or at any other time. The centre, therefore, will always be the regulating point for both pace and covering, and as there is no necessity to excite the leader's horse, or put him off his stride, by a temporary acceleration of pace, there will be no excuse for unsteady leading.

2nd. The arrangement is very simple, and always the same, to whichever hand the change is made, or whatever may be the amount of the wheel or the rate of pace.

3rd. The responsibility of the leading as to covering and pace does not change hands temporarily, nor is it divided, as is the case in some services; it rests solely and always with the leader of the division.

CHAPTER VI.

COLUMNS OF ROUTE: PRESENT SYSTEMS.

Columns of small frontage. Increasing and diminishing the front.

WHEN the small columns of twos, threes, or fours in front (*colonnes de route*) are treated of, we generally find introduced the passage from one of these small column formations to another. These movements are in our regulations classed under the head of 'increasing and diminishing the front.'

The movement of increasing the front is performed by successively moving every alternate rank of the column, by an oblique movement, alongside of and in line with the preceding rank, advancing such preceding ranks if necessary on the direct line, so as to give sufficient freedom of movement; and at the same time gradually closing up to the correct column distance. The converse of this, or diminishing the front, is nothing more than moving forward in succession on the direct line the ranks which are to have the precedence in the new column, and moving the ranks which respectively succeed them by an oblique movement to the same direct column line in rear of them.

Our change from even to odd numbers, from two to three in front, and vice versâ, compels a slight modification in this arrangement. In this case, when increasing the front, we move two successive ranks upon the oblique line; and in diminishing the front, two successive ranks pass off by a flank movement, one rank coming up abreast of the other at an increased pace.

Principles involved in increasing the front.

In order to perform the movement of increasing the front without impediment of the moving bodies, it is necessary that the units or portions of the column about to form in line, and thus increase the front, should be at a certain distance, *a b* (fig. 19), from each other on the direct column line. This distance, as well as the distance *a d f* on the diagonal line, can be easily ascertained by a very simple calculation.*

Fig. 19.

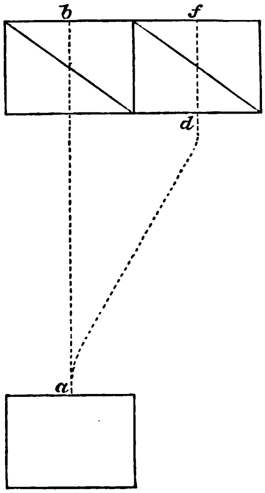
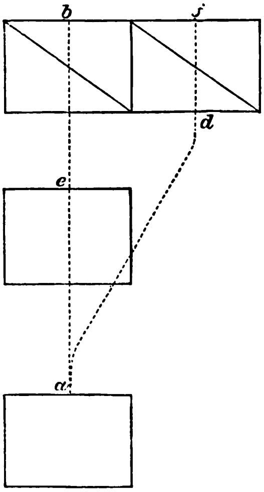


Fig. 20.



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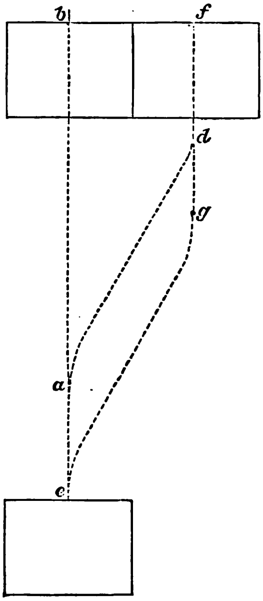
* Appendix, note 9.

It is evident, that if the distance *a e*, between the positions which the bodies actually occupy in column, is less than the distance *a b* (fig. 20), the leading body, in order to avoid a collision, and to give sufficient room, must advance the distance *e b*, which is the difference between *a b*, the distance requisite for performing the movement, and *a e*, the actual distance of the two bodies in column previous to the commencement of the movement.* On the other hand, if the distance *e b*, when in column previous to the commencement of the movement, should be greater than *a b* (fig. 21), the distance absolutely requisite to effect the movement, the rearmost body must, before commencing the movement on the diagonal line *a d f*, advance *e a*, the difference between the distance in column, and *a b*, on the direct line; or must commence the diagonal movement at once at *e*; and subsequently move up *g d f*, the difference on the direct line, into its place in line with the leading body.

Fig. 21.



In diminishing the front, the correctness is mainly dependent upon the proper timing of the movements

Principles involved

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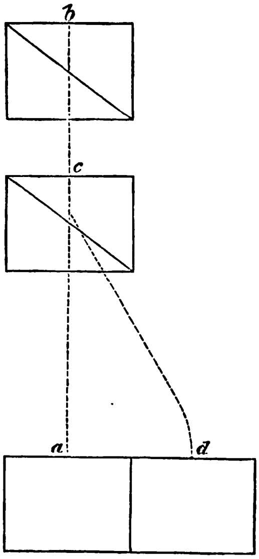
* Appendix, note 10.

in diminishing the front.

of the different portions of the column, so as to bring each rank of the new column in the direct line at the proper moment, and at the correct interval from the preceding rank.

Commencing with the first rank of the column to be diminished, and taking *c b* to represent the correct column distance, we see that, while the leading portion of the reduced column passes over the line *a b*, and thus arrives at the point *b*, the succeeding portion of the same column, passing over the diagonal line *d c*, should arrive at the same moment at the point *c*, on the direct column line, at the correct column distance *c b*, from the leading rank. In order that this may occur exactly, the body which has the longest distance to pass over must move a certain distance before the other commences to move.

Fig. 22.



If we know the length of the lines *a b* and *d c*, it is only necessary to find the difference between them, and that difference will be the start which one rank must have before the other moves off;* or, in other words, as soon as the rank of the reduced column which is to precede, and which has the longest line to pass over, has advanced this difference, the moment has arrived for the next succeeding rank to move off.

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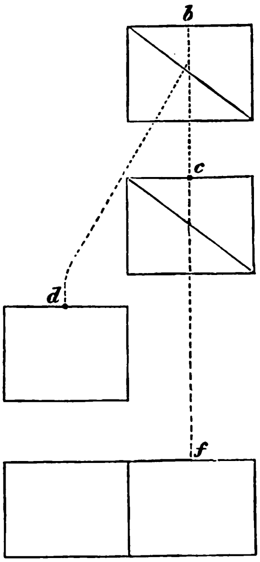
* Appendix, note 11.

We shall next consider the second rank of the column about to be diminished, in order to ascertain the correct moment for the movement of what is to be the leading portion of this rank in the reduced column, with reference to the portion of the first rank moving on the diagonal line.

Taking *c b*, as before, for the column distance, we see that the leading portion of the second rank, moving on the direct line, has to move over the line *f c*, and arrive at the point *c*, at the same moment that the rearmost portion of the first rank, moving on the diagonal, having passed over the line *d b*, arrives at the point *b*, in which case there will be *c b*, the correct column distance, between them.

Fig. 23.



As before, it is only necessary to ascertain the length of the two respective lines of movement, and their difference will be the distance which the body having the precedence in column, or the longest distance to pass over, should have advanced, before the other moves off its ground.*

Having ascertained these points with reference to the movements of the first two ranks, the same rule will hold good for the remaining ranks throughout the column.

These arrangements, although the general principle is the same throughout, are dependent to a certain extent upon the nature of the column, and we will examine as briefly as possible how the principle applies in each particular case.

Passage from single files to files: our method.

Commencing with the change from our column of single files to files, the former column is composed of single horsemen, following each other, front and rear rank alternately; the second, of ranks of two, in which each rear rank man is abreast of, or in line with, his file leader of the front rank.

All, therefore, which has to be done in this case is to bring each rear rank man, by an échelon or incline movement, alongside of his front rank man, with the correct interval between them; and if the column distance is not sufficient to admit of the rear rank man moving on the diagonal line without impediment, the front rank man must evidently advance a certain distance to afford greater freedom of movement. In the present instance four feet, or half a horse's length, is the distance which it is absolutely necessary that the front rank man should advance, in order to allow the rear rank man to come up alongside of him by an oblique movement, with an interval from centre to centre of one yard,* after which both front and rear rank men move on two direct and parallel lines of movement one yard apart, until the front rank man halts, when his rear rank man moves up in line with him.

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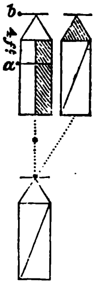
* Appendix, note 12.

Fig. 24.



This disposes of the leading rank of the column.

The remaining front rank men of the column move off at the same moment as the rear rank men of the preceding rank of the column, and continue to advance on the direct line until they arrive at the regulated distance from the rank in front of them, when they halt in their turn, and their rear ranks move abreast of them.

Our rule is that the leading rank shall continue to advance three horses' lengths (24 feet) before halting.

Files to single files: our method.

The converse of this, or the passage from files to single files, consists in moving the front rank men forward in succession on the direct line, and bringing the rear rank men, by the oblique movement, from their places alongside of their front rank leaders, into column in rear of them at the proper distance. Our instructions are as follows :—

'On the word "March," the leading man of the front rank advances straight; his rear rank man inclines to the left, covers, and follows; the remainder move off their ground as it comes to their turn; first a front rank man, and then a rear rank man, alternately.'[*]

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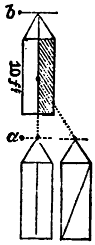
* Appendix, note 9, corollary *a*.

If both ranks were to move forward on direct parallel lines, it would be easy for each file to judge when the preceding file had advanced the correct distance, which in such case would be always the column distance; but as one rank must move on the diagonal line, while the other moves on the direct line, it is not so easy to judge the proper moment to move.

In the present case we find that the correct time for the rear rank to move off upon the diagonal line is when the front rank man has advanced from *a* to *b* (10 feet).[†]

Fig. 25.



This being only 2 feet more than the horse's length (8 feet), the practical rule in this case would be, that the rear rank man should move off on the incline, immediately after the croup of the front rank man's horse has passed the line of his own horse's head; he must not wait until the entire distance is gained, as he should do if moving on a direct line parallel with his front rank man.

Generally in this case the fault is that the rear rank man moves off too late.

We next come to the front rank man of the next succeeding rank in the column about to be reduced.

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[*] Cavalry Regulations, p. 132.

[†] Appendix, note 9, corollary β.

In this case the difference between the direct and diagonal lines of movement (being less than a foot)* may be disregarded, and the practical rule would be, that each rear rank man must move off on the diagonal line, and the front rank man of the succeeding column rank on the direct line, at the same moment.

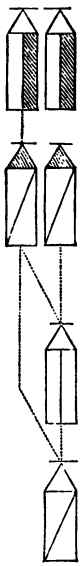
In general the fault here also consists in moving off too late.

In the French service, the instructions relative to these movements, involving the passage from single files to files, and vice versâ, are as follows:—

Single files to files: French method.

First, from single files to files.

Fig. 26.



'Doubler par deux.—Au commandement "Marche," la première file continue de marcher, et s'arrête lorsqu'elle a marché 10 pas (10 mètres); la deuxième file se porte de suite en obliquant à gauche, à hauteur de la première; en y arrivant elle se redresse et s'arrête; toutes les autres files continuent de marcher droit devant elles, les files 2 et 4 exécutant leur doublement de la même manière, mais successivement, et lorsque les files 1 et 3, sur lesquelles elles doivent doubler, sont près d'arriver à leur distance et de s'arrêter.'

In this formation the rear rank men retain their proper position in rear of their file leaders of the front rank.

The depth of the ranks is taken at 18 ft. (6 mètres), and the distance between the ranks measured from head to croup is two-thirds of a mètre (2 ft.). The column distance therefore is 20 ft.

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* Appendix, note 9, corollary γ.

We find that the distance, which it is actually necessary the leading rank should advance in order to perform the movement, is about 6 ft.;* but in the case of fours, it will be found that the distance necessary to advance is about 15 ft. (5 mètres).†

Therefore, for the sake of simplicity, one rule is laid down which more than covers both cases, and the leading rank is to advance 10 mètres (30 ft.)

Files to single files: French method.

Secondly, from files to single files. 'Dédoubler par un.—Au commandement "Marche," la file de droite du premier rang de deux continue de marcher à la même allure; toutes les autres arrêtent; la file de gauche de ce même rang ne se met en mouvement qu'à l'instant où elle est dépassée par la croupe du cheval du numéro 1 du deuxième rang; alors elle oblique à droite, et se place en colonne derrière la première file, se redressant par un quart d'à gauche en avançant.

'Chaque rang de deux exécute successivement le même mouvement; les files 1 et 3 rompant dès que les files 2 et 4 qui les précèdent ont commencé leur oblique pour entrer en colonne.'

We find that the time, when the left file of the leading rank of the column should commence the movement on the diagonal line, is when the first file has advanced 19 ft.* As the depth of ranks is 18 ft., this agrees exactly with the tenor of the instructions.

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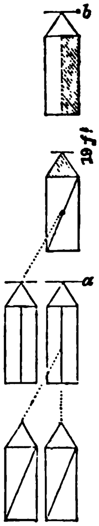
* Appendix, note 9, corollary δ.

† Appendix, note 9, corollary λ.

Fig. 27.



We find also that the distances, which the files 1 and 3 on the direct line, and 2 and 4 on the diagonal line, have to pass, in order to be correctly placed in column, differ so little from each other,† that the difference may be disregarded, and they should therefore start one on the direct line, and the other on the diagonal, at the same moment, which agrees with the instructions on this point also.

Files to sections, or three in front.

The next column of route in the ascending scale is that of three in front (sections). Our instructions for the increase of front from files to sections are as follows:—

'On the word "March," the leading front rank man advances three horses' lengths, his rear rank man inclines to the left and covers him; their centres and lefts move up abreast of them, the remainder following, and each section of threes forming, when it arrives at those which formed last.' ‡

In this passage from files to sections, in consequence of the file formation which we adopt, we have not only to change from even numbers to odd, from twos to threes, but from a column of single ranks, in which the rear rank men are abreast of their front rank men, to a column of double ranks, in which the rear rank hold their proper position in rear of their front rank leaders.

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* Appendix, note 9, corollary ϵ. † Ibid. ζ.

‡ Cavalry Regulations, p. 134.

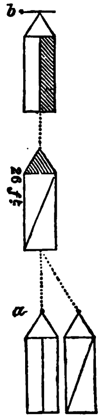
The rights, centres, and lefts, or numbers 1, 2, and 3, have therefore respectively to go through the movement of passing from files to single files, and then Nos. 2 and 3 move up abreast of No. 1 by a diagonal movement. We will consider in the first place the leading rank of the column or No. 1 file.

In order to pass from files to single files, the front rank man must advance from *a* to *b* (fig. 28), a distance of 26 feet,* only 2 feet more than the ordered distance of 24 feet, or three horses' lengths.

This is a sufficiently close approximation for practice.

If No. 2 file were to remain halted during this movement, the distance between Nos. 1 and 2 files at its completion would be 37 feet, viz. the 26 feet advanced by No. 1 file, added to 11 feet, the original column distance.

Fig. 28.



The distance necessary for bringing No. 2 in line with No. 1 by the oblique movement is 26 feet.† This, therefore, is a case in which the column distance (37 feet) is greater than the distance necessary to effect the movement.

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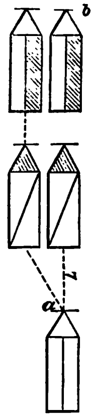
[*] Appendix, note 9, corollary η.

[†] Ibid. θ.

No. 2 must therefore advance on the direct line to the point *a* (fig. 29), which brings it within *a b* (26 feet), the required distance, or to within 7 feet of No. 1, a horse's length, measuring from head to croup; from which point No. 2 moves by the oblique movement into its place alongside of No. 1.

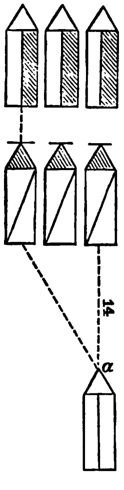
Fig. 29.



During this movement also, No. 2 passes from single to double rank; or, in other words, from files to single files, for which the forward movement of the front rank man affords sufficient room.

At the completion of the last movement, if No. 3 had remained halted, the distance from Nos. 1 and 2 formed in line to No. 3 would be 48 feet, viz.:— the advance of 26 feet added to the double column distance (22 feet). The distance requisite for performing this last portion of the movement, which completes the rank of three by bringing No. 3 by the oblique movement in line with Nos. 1 and 2, is 33 feet.*

Fig. 30.



Therefore No. 3 should advance on the direct line to the point *a*, about 14 feet (fig. 30), measuring from head to croup, from the rank formed of Nos. 1 and 2, and should then commence the oblique movement. This distance we may call in practice two horses' lengths.

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* Appendix, note 9, corollary *κ*.

As it amounts to the same thing, if the forming body advances on the direct line to the requisite distance, and then commences the oblique movement, or if it commences the oblique movement at once, and subsequently moves upon the direct line, the practical rule might be, that both Nos. 2 and 3 should commence the oblique movement upon arriving at a distance of 2 horses' lengths from No. 1.

Upon the supposition that the remainder of the column had remained halted during the formation of the first rank of threes, the No. 1, or right of the second rank of threes, would be at a distance from the first, of 59 feet, the 26 feet advanced added to three times the column distance (33 feet).

We have already shown that it requires an advance of 26 feet (the three horses' lengths ordered by regulation), to effect the formation of each rank of threes.

The second rank of threes is to be formed at a distance of 22 feet from the first, measured from front to front; for each rank of the column in this case, consisting of front and rear rank, occupies 19 feet, and there is 3 feet between ranks. This leaves 37 feet for the No. 1 of the second rank of threes to advance, which is sufficient for the completion of the movement. But as it takes 26 feet for the No. 1 or right of threes to change from files to single file, and as the rank must halt at 3 feet from the preceding rank, it will be necessary that the movement in each succeeding rank should be commenced when at about 29 feet, which we may call four horses' lengths from the croup of the preceding rank; that is, when the right of the second rank has moved about a horse's length off his ground.

The distances to be advanced by the successive ranks to reach their proper halting places in column are 37, 48, 59, 70 feet, &c.; an arithmetical progression, of which the difference is 11 feet, the column distance when in files. Each rank in succession will therefore have to advance a distance 11 feet longer than that advanced by its predecessor, before commencing the formation.

Sections, or three in front to files.

The converse of this movement (the passage from sections to files) is a very simple matter. Each rank moves off in single files from a flank, the rear ranks moving up at an increased pace alongside of their front ranks.

Files to fours, or colonne par quatre.

The next frontage in column is that of fours.

The following are the rules for doubling and dividing in this case.

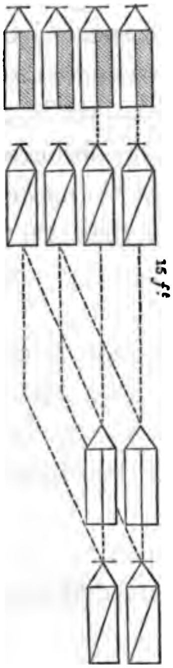
Doubling and dividing are the only movements necessary to pass from one formation to another in the small columns of route employed by the French, which consist of 1, 2, and 4 in front, each column having double the frontage of the preceding.

'Le peloton marchant en colonne par deux la droite en tête, pour faire marcher quatre.

'Au commandement "Marche," les deux premières files continuent de marcher, et s'arrêtent lorsqu'elles ont marché 10 pas (10 mètres); les deux files suivantes se portent de suite, en obliquant à gauche, à hauteur des

deux premières, en y arrivant, elles se redressent et s'arrêtent. Toutes les autres files continuent de marcher droit devant elles, les files 3 et 4 exécutant leur doublement de la même manière, mais successivement; et lorsque les files 1 et 2, sur lesquelles elles doivent doubler, sont près d'arriver à leur distance et de s'arrêter.'

Fig. 31.



According to calculation, the distance which it is absolutely necessary the leading rank should advance is 15 feet (5 mètres),* but in order to give greater freedom of movement another 5 mètres is added, and the two first files continue to advance for 10 paces or mètres.

Fours, or colonne par quatre, to files.

The details of the converse of this movement (dédoubler par deux) are as follows.

'Au commandement "Par deux," tous les cavaliers se préparent à arrêter, à l'exception des files 1 et 2 du premier rang de quatre.

'Au commandement "Marche," les files 1 et 2 du premier rang de quatre continuent de marcher à la même allure; toutes les autres arrêtent. Les files 3 et 4 de ce même rang ne se mettent en mouvement qu'à l'instant où elles sont dépassées par la croupe des chevaux des numéros 1 et 2 du deuxième rang; alors elles ob-

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* Appendix, note 9, corollary λ.

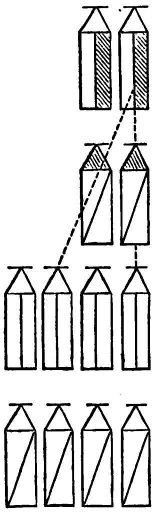
liquent à droite, et se placent en colonne derrière les files 1 et 2, se redressant par un quart d'à gauche en avançant.

'Chaque rang de quatre exécute successivement le même mouvement, les files 1 et 2 rompant dès que les files 3 et 4 du rang qui les précède ont commencé leur oblique pour entrer en colonne.

'Les files 1 et 2, qui rompent droit devant elles, règlent leur allure de manière à avoir leurs distances, et les files 3 et 4 tiennent leurs chevaux bien droits, pour ne pas gêner le mouvement des files 1 et 2.'

We find by calculation, that the start which the files Nos. 1 and 2 should get before Nos. 3 and 4 move off their ground, is about 19 feet,* and as the depth of ranks is 18 feet, this agrees exactly with the instructions.

Fig. 32.



We find also with reference to the second rank of the column, that the distances to be passed over by the files 3 and 4 of each rank, and the files 1 and 2 of the succeeding rank, only differ from each other by about a foot,† which may be disregarded in practice; and the practical rule would therefore be, that they should start together.

This also agrees with the tenor of the instructions.

The next extent of front in the ascending scale is our three formation, being six men

Increasing to and

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* Appendix, note 9, corollary μ.

† Ibid. π.

diminishing from threes, or six in front.

abreast, a column of single ranks, front and rear rank in line.

The increase of front is in this case on the move from files and sections, and at the halt from sections.

The diminution of front is only made at the halt, and to sections, files, and single files.

The rules for timing these movements might be easily ascertained by a reference to the general principle; but a much less complicated mode of passing from one column of route to another, and a much more simple arrangement of the whole matter, will be advocated.

Disadvantages of so many movements.

Many kinds of column, and many modes of changing from one of these to another, especially if the different modes of changing involve various principles, become a burden to the memory; and it requires much time and practice thoroughly to master them.

The change from one column of route to another should be a much more simple and instinctive affair than it is under the present regulation. Were it so, it would take less time to learn, would be more likely to remain fixed in the memory, when once acquired, and would certainly be more likely to work well in all weathers, on all ground, and in the hurry, excitement, and confusion of action.

The manner of change ought, if possible, to be so simple that even the horses would do it of themselves.

As for our present rules in this matter, they are difficult to learn and retain in the memory, and generally, when we have got to the end of them, we have forgotten the beginning.

Objects of the above analysis.

It may be thought that this matter has been considered too minutely, that time and trouble have been uselessly bestowed upon what is of trifling importance; but we see, in the first place, that such is not the view taken of the matter in the French service, for we find these points relating to the timing of the movements minutely considered, and rules regarding them distinctly laid down; and, in the second place, although it may seem at first sight that all these calculations and rules only end in making a difference of a foot or so, more or less —as the whole distance in these small columns is only one yard from head to croup—and although it may seem that an error in such a small distance would not in practice sensibly affect the general correctness of the movement, we must not forget that such errors go on accumulating from front to rear of the column during the movement, and that consequently what may be in front and at the commencement of the movement only an error in distance of a foot or so, becomes in the rear of the column, at the conclusion of the movement, an error of 10, 20, 40, or more yards. If only a dozen or so of horsemen had to ride together, and perform these movements with plenty of room right and left, it would be absurd to lay down minute rules in the matter, but a long column is a different thing, and all practical experience tends to show that some rule in these matters is necessary, and leads to the conviction that these are the little things which tell at critical and trying moments. Attention or inattention to these small details just makes the difference between

Importance of accuracy in movements of this nature.

a steady and correctly timed movement, and an unsteady ill-timed and straggling movement.

If we have to pass a body of cavalry through a defile of any kind in one of these small columns of route, and to come on the ground for immediate action at the other side, a case which must often happen, how important may it not be that the column should issue from the pass well closed up and ready for formation; the men with their attention directed to the proper point, and ready for the word of command, and for the work before them; the horses comparatively under control and unexcited, at least not bullied by being driven forward and then checked;—instead of issuing forth in a long straggling line at different paces, closing up and jostling, prepared for nothing but becoming a disorderly mass; the horses either worn out or mad with excitement, the men inattentive, confused and unsteady, and all ready for nothing but what is called, 'running away to the front.'

One great means of ensuring steadiness in these cases would be a well regulated timing of the movements, enabling every man in the column to know the proper moment to move off his own ground. This may be done by establishing plain and practical rules, founded on correct calculations, and the practice of these rules should become so habitual, that even the hurry and excitement of action, or the occurrence of sudden and unforeseen casualties, shall not have the power of sensibly deranging the execution of the movement.

CHAPTER VII.

COLUMNS OF ROUTE: PROPOSED ALTERATIONS.

Columns are of three classes.

COLUMNS are generally divided into three classes.

1st. The open column (*colonne avec distance*).

2nd. The close column (*colonne serrée*).

3rd. The column of route (*colonne de route*).

Characteristics of each column.

The distance between the wheeling points of two contiguous ranks of the first class is supposed to be equal to the correct distance of the same points when wheeled into line; this is the distinguishing characteristic of the open column.

The distance between corresponding points in two contiguous ranks of the close column is less than the distance between the same points when in line, and consequently the wheel into line is impracticable.

In the column of route, the distance between corresponding points in two contiguous or successive ranks is greater than the correct distance of the same points when in line; this involves the necessity of closing up in or before forming line.

There are exceptions to this in some services, the details of which it is unnecessary to enter into at present; the above description sufficiently characterises the three classes of columns.

Columns

It is usual to treat small columns of route as a sepaof route have separate rules.

rate and preparatory portion of the drill; to establish separate rules for breaking into these small columns from line, and for forming line from them to front, flanks and rear; as well as for the passage from one column to another. All this necessitates an extra number of movements adapted to these columns only, and a consequent extra load upon the memory.

Therefore much would be gained if we could manage to dispense with these extra movements, more particularly as they are rather complicated, and difficult to retain in the memory.

Necessity of simplifying these rules.

A simple and practical arrangement of these columns of route is very desirable.

They should be so arranged as to admit of perfect freedom of movement at all paces, of sufficient room for and consequent ease to the men and horses on the line of march, as well as of a rapid and steady formation from them to a fighting order, should such a formation be suddenly and unexpectedly required.

The passage from one of these columns to another should be simple, rapid, and easy.

Proposed columns of route.

It is proposed to have three descriptions of column of route.

1. Threes, or three in each rank of the column.
2. Files, or two in each rank.
3. Single files, each rank composed of one horseman.

The reasons for the adoption of three in each rank as the greatest frontage in the column of route were stated in a preceding chapter.*

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* Chapter ii. pp. 13-23.

Upon some roads and under some circumstances even this extent of front would be too great, and we must therefore have a file formation with only two abreast.

There are also many circumstances familiar to every one, and often occurring on the line of march, necessitating a single file formation.

Threes, closed up to a distance of one foot from head to croup, becomes an open column more properly expressed by the French term *colonne avec distance* ; for the column distance from wheeling point to wheeling point is nine feet, viz. eight feet for the length of the horse and one foot from head to croup; which is also the distance, according to the conventional measurement, between the same points in line.

One foot from head to croup does not however allow in movement sufficient freedom of action or ease to men and horses; there should, therefore, be an extension of two feet, giving one yard from head to croup, and making the column distance between corresponding points in the successive ranks eleven feet.

It is important that this distance should be sufficient to allow of its being maintained without inconvenience or constraint on the line of march, and to permit perfect freedom of action at all paces.

This regular distance being established, and the movements being calculated accordingly, there will be no necessity for the hurry and confusion consequent upon closing up, when a formation is suddenly required.

To threes, therefore, when closed up, belong all the properties and capabilities of the open column; and to threes extended the characteristics of the column of route.

Proposed abolition of line formation from columns of frontage less than threes.

It is proposed to dispense entirely with line formations from any columns of less frontage than threes; and it is submitted, that according to the arrangement proposed, the change from single files, files, or threes extended, to threes closed up, is so simple, easy, and rapid, that the movement becomes only an affair of a few seconds; that in the passage to threes closed up during the formation to line, neither time nor space is lost, nor is more room required than in the usual modes of forming, but much is gained in the precision and regularity of the formation, and this is really a gain of time.

Proposed abolition of passage from line to column of less than three.

It is proposed for the same reasons to dispense with the movements adapted for breaking from line into columns of smaller frontage than threes, but first to wheel into threes, and then immediately pass, if necessary, to the smaller columns.

It should be recollected that the absence of the rear rank, as is proposed, gives great facility in these movements; that the frontage in column of threes may be considered as occupying the same space as the depth of the rank in line; and that where the rank can stand in line, there the wheel into threes on the centre men is possible.

Whatever may be the mode of formation adopted, the time occupied in that formation will be the time which elapses while the last rank of the column is passing from its position in rear of the column to its proper place in line.

Formations which must be considered as regards columns of route.

With reference to columns of route, the only formations which need be taken into consideration are, in the first place, what we should call according to the present system the formation to the pivot hand (*formation en bataille sur le flanc*), and in the second place, the formation to the reverse hand (*formation sur le prolongement en avant du flanc*). Formations to the rear amount to nothing more than first wheeling the column to the right or left, and then forming either to the flank or in prolongation of the flank.

The consideration of the front formation may be altogether omitted, for it supposes a case not likely to occur in practice with relation to the column of route, namely, the existence of an available space in rear of the line of formation, equal in depth to the depth of the column, and in breadth to the extent of front in line.

As small columns of route are generally adopted for road marching, passing defiles, &c., and the formations are made immediately upon issuing on to the open ground, this available space in rear of the line of formation is not likely to exist, and consequently we find in our regulations the following :—

'In formations to the front, immediately on issuing from narrow ways or streets, it is impossible for the rear, who are not yet clear of the defile, to incline at once towards their places in line; on these occasions, therefore, the formation of all but the head of the column becomes the same as laid down for "formations to the reverse flank."' *

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* Cavalry Regulations, p. 124.

This being the case, it is hardly worth while to increase the number of movements, to provide for a case of rare occurrence, especially as by adopting a front formation adapted to each description of column, the space or time saved is too small to compensate for the loss of simplicity or the time and trouble imposed by adding to the number of formations;* besides which the ranks of the column are first separately on the incline, and then in direct échelon till they reach their places in line, so that the incline, by which this movement is effected, becomes, when the column is of any considerable length, a straggling and irregular movement, unless the men are very steady and well drilled, and the horses well broken.

The consideration of these movements as separate formations may therefore be omitted, and we need only consider the really practical mode of forming from the columns of route.

Proposed method of formation to either flank.

We have then only two formations to deal with:—1st. The formation to the flank; and 2ndly. The formation in prolongation of the flank.

In the first of these formations, the last rank of the column passes over the depth of the column less the extent of front, and in the second the depth of the column added to the extent of front.

The passage from a column of any given frontage and depth to another column of greater frontage and consequently less depth, whatever may be the process adopted for effecting the change, will always occupy the time during which the last rank of the column is passing over a distance equal to the difference between the depths of the two columns. This difference can evidently never be greater than the distance which the last rank of the column has to pass over in both cases of formation to reach its place in line. Therefore each rank of the column will be formed in three, before reaching its forming point in line, and hence there will be no loss of space or time.

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* Appendix, note 13.

Space and time not being affected, the only difference existing between the proposed mode of formation and the present mode is, that the wheel into line, whether successive or all together, will always be made in ranks of threes, instead of in ranks of threes, files, or single files : and this will be of advantage, as tending to make the formation more compact and less straggling. Why then should we have three or four ways of forming line, when one will answer the purpose not only equally well but even better?

Proposed method of change from one column to another.

We will now proceed to the mode of passing or changing from one column of route to another.

There being, as proposed, only three descriptions of column of route, there can be only six different changes, commencing at the lowest frontage. These are from single files to files, and from files to single files. From files to threes, and from threes to files. From single files to threes, and from threes to single files.

This last change, from the smallest to the greatest frontage, does not seem to be adopted in some services, but it is useful and necessary; for instance, after crossing a river in single file, it may be desirable that a column of as little depth as possible should at once be formed.

According to the arrangement proposed, the men need only tell off by threes as at present. They will not be required to tell off by files.

It is only necessary to explain the movements of the first six men, told off from the right, who will form the two first ranks of a column of threes, if wheeled to the right, as the movements will be exactly similar throughout all the successive ranks of the column. These six men shall be indicated by '1st rank,' and '2nd rank.' 1st rank meaning the first three men told off, and 2nd rank meaning the next three men told off.

1. Single files to files.

1. Single files to files.

1*st Rank* (fig. 33).—The right of threes continues to advance for five paces.

The centre moves up alongside of the right by the incline.

The left follows and covers the centre, turning upon the diagonal at the same point at which the centre commenced the incline.

2*nd Rank* (fig. 34).—The right of threes advances straight to the front, and halts on the right of the left of threes of the 1st rank, moving off at the same moment with the left of the preceding rank.

The centre follows and covers the right.

Fig. 33.

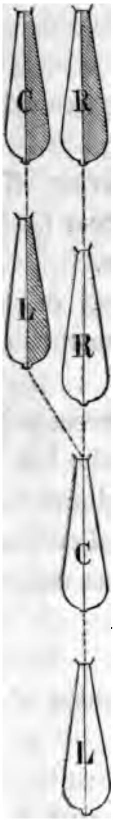


Fig. 34.

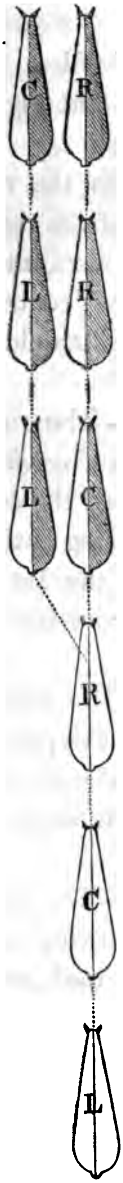
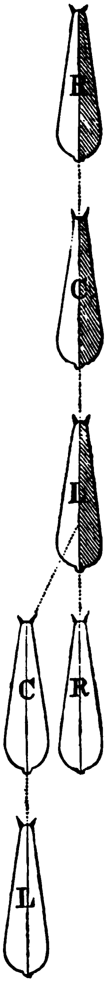


Fig. 35.



The left moves up alongside of the centre by the incline.

2. Files to single files.

2. From files to single files.

1*st Rank* (fig. 35).—The right of threes advances straight to the front.

The centre inclines to the right, moving off when the croup of the horse of the right of threes has passed his own horse's head, covers, and follows.

The left follows the centre, moving off at the same moment, and maintaining the correct column distance.

2*nd Rank* (fig. 36).—The right of threes advances straight to the front, moving off just as the left of the preceding rank has gained the correct column distance, but preserving the covering in the general column line; and when the left of the 1st rank has entered the column, following and covering as usual.

3. Files to threes.

3. Files to threes.

1*st Rank* (fig. 37).—The right and centre of threes continue to advance for five paces.

The left moves up alongside of the centre by the incline, moving off at the same moment with the right and centre.

2*nd Rank* (fig. 38).—The right of threes advances straight to the front, moving off at the same moment with the left of the 1st rank, and halts at the correct column distance from the 1st rank.

The centre and left move off at the same moment with the right, and form up on the left by the incline.

4. Threes to files.

4. Threes to files.

1*st Rank* (fig. 39).—The right and centre of threes advance straight to the front.

Fig. 36.

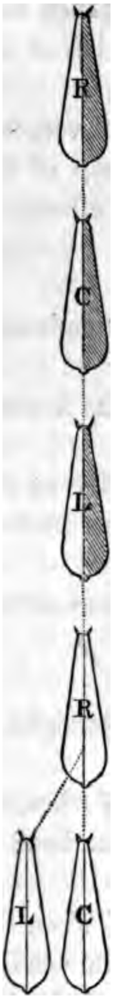


Fig. 37.

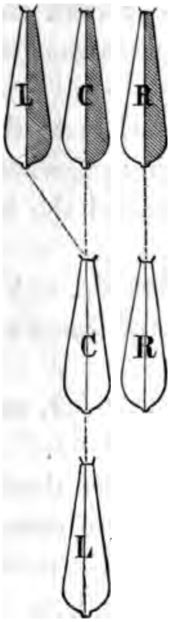


Fig. 38.

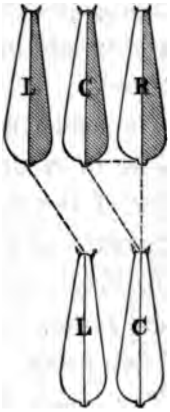
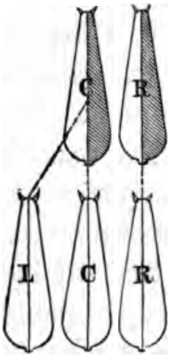


Fig. 39.



The left inclines to the right, follows, and covers the centre, moving off when the croup of the horse of the centre has passed the head of his own horse.

2nd Rank (fig. 40).—The right of threes advances straight, preserving the correct column distance and covering and moves forward alongside of the left of the 1st rank.

The centre and left incline to the right, cover, and follow in column, moving off when the croup of the horse of the right has passed the head of the horse of the centre of threes.

5. Single files to threes.

5. Single files to threes (fig. 41).

1*st Rank.*—The right of threes continues to advance for five paces.

The centre inclines to the left, and forms up in rank with the right.

The left follows, turns upon the diagonal line at the same point where the centre commenced the incline, and forms upon the left of the rank.

The movement of the 2nd rank is the same as that of the 1st rank.

6. Threes to single files.

6. Threes to single files (fig. 42).

1*st Rank.*—The right of threes advances straight to the front.

The centre inclines to the right, moving off when the croup of the horse of the right has passed the head of his own horse.

The left inclines to the right, moving off when the croup of the horse of the centre has passed the head of his own horse, moves upon the incline till he reaches the column direction, then follows, and covers in the column line.

2nd Rank.—The right of threes moves straight to the front, moving off at the same moment with the left of the preceding rank.

Fig. 40.

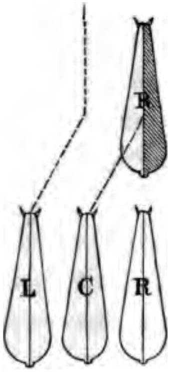


Fig. 41.

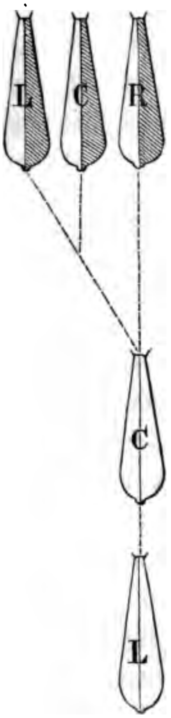
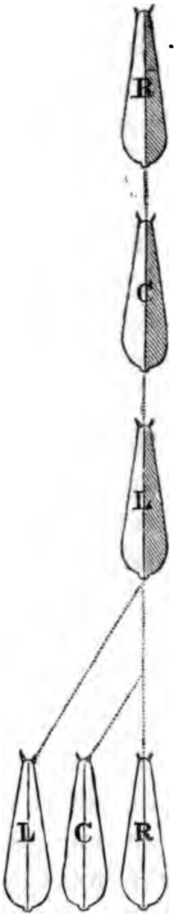


Fig. 42.



The movement is the same as that of the 1st rank.

It will be observed, that in these changes the rights of Simplicity of these move-ments. threes never leave the direct column line, but preserve the correct line of covering throughout. They therefore are a guide for the movements of the centres and lefts, in increasing and diminishing the front of the column.

In increasing the front, the movement, as regards the rights of threes, is nothing more than a simple closing up to the correct distance from the rank formed in front, the space on the direct line being left available for that purpose by the movements of the centres and lefts. The rights of threes move to the front together, as the lefts of the preceding ranks quit their ground. The whole length of the column, therefore, is in movement at the same time, and the closing up is continuous without check or stoppage.

In diminishing the front, the rights of threes have only to move off at the correct distance from the preceding rank into column. In diminishing from files to single files, this distance must be judged when the preceding rank is on a line of covering different from that upon which the rights of threes are moving; but as the two lines of covering are only one yard apart, this cannot be attended with any difficulty.

The incline as required in these move-ments. The only remaining movement to be considered as involved in these changes is the change or passage from one line of covering to the other by the incline or diagonal movement.

The same angle of inclination (30°) as that adopted in our service is retained, for, as already explained, it allows more freedom of movement than a smaller angle.

In increasing the front, it is only necessary to advance the rank in front sufficiently to leave full room for the incline, the movements on the direct and diagonal lines being commenced at the same moment.

In diminishing the front, it is necessary to determine correctly the time at which the diagonal movement should be commenced, with reference to the movement of the preceding rank of the new column on the direct line.

We find that in order to bring both ranks into the direct column line of covering, with the correct column distance from head to croup between them, the rank moving on the direct line must have advanced a distance of ten feet on such line, before the succeeding rank moves off upon the diagonal line.* The length of the horse is taken at eight feet; this leaves a start of two feet counting from head to croup. But as there is a momentary pause, during the time of communicating the forward impulse to the horse, the rule above given is a sufficiently close approximation for practice. In order, therefore, to pass in rear of the file moving on the direct line, and then take up the covering, the moment for the start of the file moving on the diagonal line is when the line of his horse's head is completely cleared by the croup of the horse of the file moving on the direct line. He must not wait for the column distance to be gained, as he should do if both moved on the direct line.

* Appendix, note 9, corollary β.

This rule being the same on all such occasions can be easily learnt, and the movement may be practised by a few men together at all paces until it has become habitual and easy; the horses with a little practice will get into the way of doing it of themselves.

The incline is a difficult movement and productive of extension and unsteadiness, when even a small number of men are moving by it abreast of each other, particularly if the pace is quick; but it will be observed, that in no case in these movements are more than two men on the incline abreast of each other at the same time; and they only for a distance of six yards, which, at the slowest pace, the walk, is passed over in three seconds.

By making the incline also at an angle of one-third of a right angle the greatest possible freedom is given to the movement. Moreover, as the incline is on the flank of the column, while the rights of threes are moving on the direct line on the other flank as guides, a slight extension of the centres and lefts, if it should occur, can be easily rectified, and would produce no effect upon the general correctness of the movement.

Practical rules for time and space occupied by these movements.

We next come to the time occupied and distances passed over in these movements, first, as effected by halting one portion of the column, secondly, as made on the move by an increase of pace.

First, from the halt.

In the first case, when the front is increased, the distance passed over by the last rank of a column in changing to a column of greater front and consequently of less depth, is evidently the difference between the depths of the two columns, and this distance in yards, divided by 2, 4, &c. according to the pace, gives the time in seconds occupied in the movement.

In diminishing the front also, it is evident that the distance passed over by the leading ranks during the completion of this movement is the difference in the depths of the two columns.

As the number of ranks in a column increases proportionately as the front is diminished, the depths of the columns are evidently inversely proportional to their frontage; therefore the column distance being the same (11 feet) in all the columns of route, the column of files is evidently in depth $\frac{3}{2}$ or one and a half the column of threes; and the column of single files is twice the column of files, or three times the column of threes.

Hence, the difference between the column of threes and the column of files is evidently half the column of threes, or one-third of the column of files.

The difference between the column of files and column of single files is once the column of files, three times the former difference.

The difference between the column of threes and column of single files is evidently twice the column of threes, four times the first difference. Therefore, if we ascertain the time occupied in passing over half the depth of the column of threes, at any of the different paces, this will be the time required to change from files to threes or vice versâ. Thrice this time will be required to change from single files to files, or vice versâ, and four times this time to change from single files to threes, and vice versâ.

Threes closed up to wheeling distance, one foot from head to croup, is the formation from which we can pass at once to the order in line, by a simple wheel of the ranks of the column to either hand. It is therefore necessary to know the time required to pass to this order from threes extended, from files, and from single files.

We find that the number of seconds required to pass to this order from threes extended is one-ninth the number of files in the line from which the column is formed.* This number of seconds, multiplied by 3¾, is required to pass from files, and the same, multiplied by 12, from single files. This is supposing the movement to be at the walk. Half the time will be required at the trot, and one-third at the gallop of manœuvre.

Secondly, on the move. We now come to the time occupied in passing from one column of route to another on the move, when the change is effected by an increase of pace in one portion of the column, the remainder of the column continuing on the move at the original pace.

We find that, according to the combination of paces which we have adopted, the following rule may be always applied :†—

The number of seconds occupied in changing from one column to another is always half the difference (in yards) between the depths of the two columns.

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* Appendix, note 14.

† Ibid. note 15.

The number of yards passed over by the leading rank is always the above number of seconds multiplied by the figure representing, when increasing, the slower pace; when decreasing, the faster pace.

The differences between the depths of columns have been already shown (*ante*, p. 123); and the figures 2, 4, &c., represent the pace according as the walk, trot, &c. is used.

For example, a squadron of 48 files, moving in column of files at the walk, changes at the trot to column of threes.

The difference between the depths of the columns is half the depth of the column of threes; and the depth in yards of the column of threes is 48, added to two-ninths of 48, in all 58⅔. Half this, or 29⅓, represents the number of seconds occupied in the change.

This 29⅓, multiplied by 2, the figure representing the walk at which the leading rank moves, gives 58⅔, which is the number of yards passed over during the change by the leading rank.

If the paces were the trot and gallop, the 29⅓ must be multiplied by 4 instead of 2; if the gallop and gallop out, by 6 instead of 2.

Therefore a squadron, or any other body, will pass from files to threes, while the head of the column of threes is passing over half its own depth, when the paces, by the combination of which the change is effected, are the walk and the trot.

When the paces are the trot and the gallop, the change will be made while the head of the column of threes passes over a distance equal to its own depth.

When the paces are the gallop and the gallop out, the change will be made while the head of the column of threes passes over a distance equal to once and a half its own depth.

Then follows the halt, the momentary pause during the close up from threes extended to threes at wheeling distance, the correction of covering, and getting the horses well in hand, succeeded by the wheel into line to either hand, which places at least one squadron of the force in fighting order, and forms a temporary screen for the passage and formation of the remainder of the column.

Necessity of establishing these rules

It is always important to know how soon a column of route, which is a helpless formation for cavalry, can be transformed, either in whole or part, into a fighting formation in line; and it is particularly so in the system now proposed, in which the rear rank becomes a line of support to the front rank, at a certain short distance, instead of being at close quarters, as in the present system; for it is necessary to show that upon issuing from defiles, streets, roads, &c., or in other words passing from column of route to line, the supporting rank will be in its place at the proper time and distance; and as the front line forms before the second line, or rear rank, commences its formation, in order to prove this it is necessary to know the time occupied in the formation of the front line.

Also if the formation is made on the move, we should know the distance advanced by each portion of the first line, before the corresponding portion of the supporting rank is formed in rear of it; for such distance will evidently be the distance between the two ranks. This belongs more properly to the formation from column to line, and when that subject is treated of we will enter into it more fully.

Summary of advantages of the proposed system.

The endeavour has here been made to show that by the method proposed of passing from single files or files to threes, during formation, neither a yard of distance or a second of time is lost, either on the move, or when the change is preceded or followed by the halt; but that much is gained in compactness of movement, and in steadiness.

If this be admitted, we gain much also by striking out at once so many movements consequent upon the necessity of forming from and breaking into columns of files and single files; and we thereby abridge the course of preliminary instruction, and leave more time for other important matters, riding, use of the arms, and other individual training so necessary for the cavalry soldier.

Also in training to act as cavalry men who can already ride and manage their horses, and whose horses are broken and manageable, when the time available for training is limited, it is very desirable that the arrangement of these small columns of route should be as easily and quickly learnt as possible.

The power of moving in these columns of route is the first step towards acting in a body, for they form the means of passing collectively from one point to another.

The changes just described are so simple and palpable that a single lesson ought to be sufficient to teach them to men who can already manage their horses. For instance, in changing from single files to files, it must be apparent at once, that in order to form twos from single file, every second man must come up alongside of the man in his front; and in forming threes from files, it would be the natural impulse of the man told off as the left of the first rank of threes of the column, when he saw there were only two men in front of him, and knew there ought to be three, to move up abreast of the two men in his front; and when his movement had left the right of the next rank of threes by himself, it would be the natural impulse of the next two men of the same rank to move up abreast of him, and thus form a rank of threes, and so on throughout the column.

If three men are riding together, and if one of the three, on account of the narrowness of the road or for any other reason, is obliged to drop behind, it requires no particular instruction to enable him, when the road widens, to ride up alongside of his companions, and it would only be once to point out to men that the same simple process will answer, to enable them to move collectively in large bodies.

To acquire the proper timing and steadiness of movement, more particularly at the quicker paces, of course a certain amount of practice would be necessary; but the first point is to get men to move together, and if that can be very quickly accomplished, the mere act of moving will be practice in itself.

Intelligent men who can ride, and wish to learn, will soon find out the right way of doing things for themselves in detail, when they have been once shown the general principle.

CHAPTER VIII.

PASSAGE FROM COLUMN TO LINE: PRESENT SYSTEMS.

Passage from column to line, to the flank; in prolongation of the flank, to the front.

THE passage from column to line to the flank is effected, both in our own and the French service, by the simultaneous wheel; or, when the formation is in prolongation of the flank line of the column, by the successive wheel into line of the ranks of the column.

The principal and most approved mode of forming line to the front, in our service, is by means of the oblique échelons of troops.

Objections to this last method of formation.

The principal objections to this formation, when applied to cavalry movements, are as follows:—

A line formation is only possible in one direction, by the wheel into line of the ranks composing the échelons, and this only upon the supposition that the covering and distances have been correctly preserved.

Difficulties of oblique échelons.

The preservation of the covering and distance is particularly difficult for cavalry when in this formation, especially at the fast paces.

If the covering is taken along the front or rear line of pivots, even at the walk it is most difficult, and at the faster paces, all but impossible, to keep it; for even a slight wavering in the line of pivots, the springing forward or hanging back of a single horse, a slight loss of covering in any one of the ranks of the échelon, shuts out the view of the line of covering, and, until the view of the general line is regained, there is no guide whatever for the échelons in rear of the point where the covering was lost.

This method of covering also involves the difficulty attendant upon moving in one direction, and preserving the line of dressing in another; and requires that the post of the leader of each échelon, with reference to covering, be actually on the pivot flank of the échelon which he leads.

Responsibility of leading badly divided.

The position of the troop leader in our service, in front of the second file from the directing hand, renders it impossible that he can preserve the covering upon this principle; hence arises a divided responsibility, the leader being answerable for the distance, and the guides for the covering.

This produces a complication, where all ought to be simple and plain: increases the number of links in the chain of responsibility, and consequently the number of sources of error.

In the present case we not only increase the number of responsible leaders, by breaking up the squadron into two parts, but we add in addition what may be called a twisted link between the leader and the troop or body which he leads; for the troop must move and dress by the guide; the guide is responsible for the distance from the troop leader; and the troop leader is responsible for the distance from the troop in front; besides which, the guide must judge the covering for himself, without any reference in that respect to the position of the leader.

It can scarcely be denied that this arrangement is bad, for surely the leader of a body of cavalry in the field, when in presence of the enemy, should be wholly and solely responsible for the leading of the body which he commands; all ranks should look to him for guidance and direction; and divided responsibility should be avoided as much as possible.

Difficulty of correct covering.

It is not distinctly laid down in our regulations by what method the covering is to be preserved by the guides on the inner flanks of troops, and it is only by inference that we can come to the conclusion that the guides are responsible for the covering in oblique échelons as well as in column of troops.

If the principle of covering along the oblique line of the flanks of the échelons is not followed, the only remaining method is that of covering a particular file of the échelon in front.

In this case we are liable to the error produced by the opening out and closing of the ranks, as well as by the line of covering being broken instead of continuous. Altogether the system appears too complicated to be depended upon for rough work and rapid movements, and if the covering and distance cannot be preserved at all paces, and under all circumstances, we lose the great advantage supposed to belong to the oblique échelon formation, namely, the power at any moment to stop the movement and wheel into line.

In consequence of the échelons overlapping each other, the view of the leaders to the front is obstructed, and the sound is impeded. From the same cause, also, any formation, or even action, in the direction of the line of movement of the échelons, is precluded; and the only portion of the échelons which is free to act in that direction is the leading troop. If the others attempt to attack in échelons, or to form line in this direction, they must ride over each other.

Line cannot be formed in any useful direction during the movement.

It is to be supposed that in the first instance the column is moving in the direction of the enemy; this may be considered as implied by the fact of the formation being to the front.

If the enemy changes position during the process of our formation, and threatens an attack from a new quarter, it is hardly probable that he will have made so long a circuit in so short a time, as to appear suddenly directly on our flank; it is much more likely that an attack of this kind would come from a direction opposite to our right or left front, and in this direction we cannot form, and can only meet the attack with one troop. If this be admitted, it appears that when this formation is adopted, we are prepared to meet an attack from a quarter from which it is unlikely that it will come, and are unprepared for it in the quarter from which it may reasonably be expected; and we are only prepared for it in any direction upon the supposition that the covering and distances have been strictly preserved.

Error in one troop

The oblique échelon movement by troops requires ground open and free from obstacles.

throws out the whole body.

If a single troop is thrown out, a link in the chain of covering is lost, and if the pace is rapid, it will be found very difficult to reunite the separated parts of the chain; consequently, the general wheel into line becomes an impossibility on broken ground.

French method of meeting this difficulty.

In the French service, the difficulty just mentioned is got over by breaking up the general column into squadron columns of pelotons (divisions), which move upon parallel diagonal lines to sixty paces in rear of their points of formation in line; each column then wheels so as to place the front of the column parallel to the future alignment, and the squadron formation to line is completed by the oblique échelon movement within the sixty paces.

These small columns are better adapted for passing over broken or obstructed ground, than our oblique échelons of troops.

Both systems, however, require that the rear of the column to be formed in line should be extricated from a defile of any description, which might interfere with the diagonal movement, before the formation can commence.

Conclusions drawn from the above.

These facts all point to the conclusion that a system admitting of a gradual formation into line upon the leading rank, or moving base of formation, during the advance, and therefore affording no fixed mark for the enemy's artillery during the formation, and which may commence at once upon issuing from a defile, would be better adapted to present circumstances; and the details of such a system shall now be proposed.

CHAPTER IX.

PASSAGE FROM COLUMN TO LINE: PROPOSED ALTERATIONS.

Chief element in all formations of line from column.

IF we reduce the line formation from column to its most simple elements, we shall find that there is but one way of effecting this movement, namely, by means of the wheel of the units or ranks of the column. This wheel may be simultaneous, as in the case of the wheel into line from open column; it may be successive, as in our formation to the reverse flank, or there may be an intermediate échelon formation either oblique or direct, as in some of our front formations.

The angle of inclination, formed by the line or lines of movement of the portion of the column in process of formation with the original line of movement of the column, may be varied; the wheel of the units of formation may be made on the principle of the halted or of the movable pivot; the regulating point during the wheel may be in the centre of the wheeling body, at the flank, or at an intermediate point; the working of the principle may be modified by altering the unit of formation during the movement, as in our 'inverted line to the front,' and in the French formation by means of squadron columns; but all these different cases will be found to represent only modifications of the line formation from column, by means of the wheel of the units or ranks of the column; and thus, in its most simple expression, we will, in the first instance, deal with the subject.

Angle of inclination.

In order to effect a line formation, all the units of formation, with the exception of the unit upon which the formation is made, must pass on to a line or lines of movement forming a certain angle with the general line of movement of the column. This angle we will call the angle of inclination at which the formation is effected.

Proposed line formation at the halt.

It will be found upon reference to the notes upon this subject,* that if the formation is made, according to the common mode of expression, 'at the halt,' the first or leading rank must advance a certain distance during the movement, in order to prevent a collision of the units of formation.

Distance to be advanced by the leading rank during formation.

This distance, expressed in terms of the depth of the column, varies inversely with the angle of inclination, diminishing as that angle increases, till the angle of inclination becomes a right angle, when this distance equals 0. In our front formations, we have reduced this distance to its minimum value, without reference to the angle of inclination, by carrying the general principle in its most simple form no farther than the first two ranks of the column; the remainder passing from column to line by means of an intermediate formation in oblique échelons; but to gain this advantage, if such it be, we have incurred all the penalties attendant upon the employment of oblique échelons in cavalry movements.

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* Appendix, note 16.

The French, by making use of squadron columns, have reduced the amount of this preliminary advance of the leading rank to the length of the squadron column; but, by so doing, they have incurred the necessity of advancing the whole length of the column, upon issuing from a defile, or passing round the flank of a body of formed troops, before the formation is commenced.

It will be found, on reference to the notes, that employing the general and most simple mode of formation, we can reduce this distance at pleasure, by merely varying the angle of inclination; the distance becoming 0, when the angle of inclination is a right-angle.

The distances to be advanced under different circumstances, and corresponding to the different angles of inclination, will be found in the Tables given in the notes.

Proposed formation on the move.

Passing from this part of the subject, we come to what, under present circumstances, is of much greater importance, namely, that which is commonly called 'the formation on the move.'

It seems to me that the days for great exactness in the matter of intervals and dressing, for taking up alignments before the arrival of the cavalry which are to occupy positions, for remaining formed previous to action, for preliminary movements and counter movements, are fast passing away; and that a system of small columns and rapid formations on the move, leaving us free to take advantage of the formation of the ground, and affording little time for the counter movements, or for the action of the artillery of the enemy, will probably supersede the old system, being more suited to the present time, and more in accordance with modern changes and improvements.

Combinations of paces during formation.

The paces, by a combination of which the cavalry formations on the move are to be effected, without reference to the horse artillery, are the walk, the trot, and the gallop.

From these three rates or paces, three combinations can be formed:

1st. The walk and trot.

2nd. The trot and gallop.

3rd. The walk and gallop.

The walk and trot combined.

We find, upon referring to the notes, that the first combination is applicable to all angles of inclination; but, that when the angle of inclination is 67° 30′ (three quarters right), the distance passed over by the leading rank during the formation is at a minimum, and equals about twice the extent of front in line. This, therefore, will be the most suitable angle of inclination, when the first combination is employed.

The formation under this combination ought to be made with great steadiness, the trot being the fastest pace employed.

The formation of a squadron will be completed, when the leading rank has advanced a distance equal to about twice the squadron front; the formation of two squadrons, when the leading rank has advanced four times the squadron front, &c. &c. One regiment will be formed when the leading rank has advanced a distance equal to twice the front of the regiment in line; a brigade, when the leading rank has advanced a distance equal to twice the front of the brigade in line, &c. &c.

Value of this combination.

It has been already shown that the formation commences at once upon issuing from a defile, that the column is covered and protected throughout the movement, and that the different units pass at once from column to line.

The formed portion may be halted at any moment, and the remainder of the formation completed, by merely altering the angle of inclination of the line of movement of the column. This is done by the head of the column, and the remainder have only to follow and form in succession. Or, if required, the pace of the formed portion may be altered, the leading rank and the remaining ranks of the column regulating their pace in accordance with the alteration.

In short, the forming body remains completely in hand; and no change or no circumstances ought to throw out or disorder the movement.

The ranks still remaining in column have only simply to follow the leader at the pace, and in the direction given by the head of the column, until they arrive at their own special line of formation.

The wheels being all made upon the principle already stated in the 'march in column,' ought to produce no unsteadiness in the movement.

The trot and gallop combined.

A reference to the notes (Table IV.) will show that, when the second combination of paces is used, the distance advanced by the leading rank during the formation is at a minimum, when the angle of inclination equals 22° 30′ (quarter right), and that this distance is rather more than twice-and-a-half the extent of front of the forming body when in line.

Uses of this combination.

There may be cases, in which it may be necessary or desirable to advance rapidly over a considerable extent of ground to the point of action, and yet to arrive to a certain extent formed or in fighting order, at or near such point; to such cases, this mode of formation is peculiarly applicable.

It is evident, on a reference to the details of the formation stated in the notes, that in this case, as in the former, the forming body during the process of formation remains completely in hand, the column also being covered and protected to the last moment.

The walk and gallop combined.

The Tables show, that when the third combination is employed, the distance advanced by the leading rank, during the formation, is at a minimum when the angle of inclination is equal to 90°, and that, in such case, this distance equals about the extent of front of the forming body when in line.

Application of this combination.

There may be cases when a rapid formation in line or fighting order is required, before the leading rank has advanced any considerable distance; and to such cases this mode of formation is applicable; but it will be evident, from what has been stated in the notes, that the alteration of pace by means of which the formation is to be effected must not commence until the second rank of the column has completed the wheel from column, which places it on the perpendicular line of movement.

For instance, if we should suppose a force to be moving at the gallop in column of threes through a narrow pass or road, and that it becomes necessary to effect the formation immediately upon issuing from such road or pass on to the open ground.

The column, in the first instance, wheels steadily to the left; this is upon the supposition that the open ground for forming is on the left, and the protected flank the right; but if it were, the arrangement would of course hold good, only substituting right for left, and vice versâ. The object of this wheel to the left is to clear the mouth of the defile for the subsequent passage of the artillery.

The formation then commences at once, by the leading rank wheeling to the right, and dropping into the walk immediately the second rank of the column has completed the wheel. The remainder of the column continues the gallop, each unit of formation dropping into the walk on reaching the alignment. The artillery passes to the front, to protect the formation and advance, as detailed in a future chapter.

It will be seen that this mode of formation is particularly well calculated for cases of great emergency, for those cases which so often occur in practice, as for instance:—

The cavalry is suddenly sent for, and ordered to move without a moment's delay to a certain point, and there to act immediately, little consideration having probably been given to the nature of the ground which the cavalry will have to pass over to reach the point of action. Orders upon orders will most likely reach the commandant of the cavalry to hasten, move at once, lose no time, gallop, &c. &c.; and as things generally happen at cross purposes on these occasions, the commandant will probably find broken ground, a narrow road, or a difficult pass in his way.

The present mode of formation is well adapted to meet a case of this kind, for the entire movement may be effected at the gallop, with perfect steadiness, and with as little exertion to the horses as is consistent with the employment of so rapid a pace.

Line formation of the rear rank.

It has been shown that the extension of the squadron column of threes, consequent upon the increased distance to be taken between ranks, when the column is in movement, will always be less than the squadron interval in line by a very small distance, and may therefore in practice be taken equal to such interval.

Therefore, the extension on this account will just fill up the squadron intervals.

It has also been shown that the extension, caused by the necessity of introducing additional ranks into the column, in order to admit the officers and serrefiles, &c., will, under all ordinary circumstances, be a little in excess of the squadron interval in line, which is one-fourth of the extent of front.

It is therefore evident that we may take the depth of the regimental column of threes, equal to once-

and-a-quarter, or five-fourths of the extent of front in line.

Hence we see that at the moment at which the alteration of pace takes place, and the line formation is commenced from column of threes, the head of the rear rank column will be at a distance from the leading rank equal to once-and-a-quarter the extent of front in line.

According to the proposed arrangement for effecting the formation, the leading rank moves with the slower velocity expressed by v while the rear rank column is moving with the faster velocity $a\,v$,* until the formation of the rear rank column commences, when the leading rank of the rear rank column in turn takes up the velocity v.

Distance of the rear from the front rank.

If the rear rank commences the formation exactly at the same point that the formation of the front rank commenced, then the distance between the two ranks will evidently equal once-and-a-quarter the extent of front in line divided by a.

It is shown in the notes that in the first combination (the walk and trot), a equals 2.

That in the second combination (the trot and gallop), a equals $\frac{3}{2}$.

That in the third combination (the walk and gallop), a equals 3.

Therefore, when the first combination is employed, the distance between ranks, when the formation is completed, will be $\frac{5}{8}$, a little more than half the regimental

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* Appendix, note 16.

1. 'Garde à vous.

2. 'Changement de front oblique—sur l'aile droite.

3. 'Marche.

'Au deuxième commandement, répété par les chefs d'escadrons, le capitaine commandant du premier escadron commande: "Escadron demi-à-droite." Les capitaines des cinq autres escadrons commandent: 1. "Escadron en avant;" 2. "Guide à droite."

'Au commandement, "Marche," répété par les chefs d'escadrons et par les capitaines commandants, le premier escadron exécute son demi-à-droite; ce mouvement étant pres de finir, le capitaine commande: 1. "Escadron;" 2. "Halte;" 3. "À droite alignement;" 4. "Fixe."

'Les autres escadrons se portent droit devant eux, et chaque capitaine commande successivement: "Escadron demi-à-droite," assez à temps pour commander "marche," lorsque la droite de son escadron arrive vis-à-vis, et dans la direction du point où elle doit s'appuyer. Le demi-à-droite exécuté, il commande: 1. "En-avant;" 2. "Guide à droite;" et à hauteur des serre-file: 1. "Escadron;" 2. "Halte;" 3. "À droite alignement;" 4. "Fixe."

'Le Régiment étant aligné, le colonel commande: "Fixe."'

French method preferable to our own.

This mode of changing front appears preferable to our own method, performed by means of the oblique échelons of troops, for the following reasons:—

The unit into which the line is broken during the process of formation is the squadron, instead of the half squadron or troop. As the movements *en bataille* are supposed to be made in the immediate presence of an enemy, and as consequently it is desirable to preserve the force, even when in a state of transition from one formation to another, in as large bodies as possible, the squadron is evidently better adapted than the troop to act independently upon a sudden emergency.

Squadron a better unit of formation than the troop.

According to the French arrangement, part of the force effecting the change is, during the transition, in line facing to the original direction; part in line, or direct échelons, facing in the new direction; and one squadron on the wheel while changing one line of movement for the other. These are all more or less fighting orders, and a sudden and unexpected attack might be met during the change in three directions. In a direction perpendicular to the original front, by the portion of the force still parallel to the old alignment; in a direction perpendicular to the new front, by the portion having completed the change; and by one squadron in a direction threatening the angle or space between the two contiguous flanks.

Force better prepared to repel an attack.

In the French arrangement, also, the front is open, the view is unobstructed, and the sound of signals or words of command is unimpeded during the movement. This is a matter of great importance; for, although all must submit implicitly to the orders and indications of the chief, still it will be well if the leaders of the component parts of the force can see clearly what is going on in front, and can thus be enabled to conform to the general intention of the movement, in the event of the

Front less obstructed, sound less impeded.

signal or word of command by any accident failing to reach them.

An open front, and the consequent unimpeded passage of sound, is of more importance than is generally supposed. Let anyone, for experiment, place himself in the position of troop leader, in a formation of considerable extent, in oblique échelons of troops, moving at the trot or the gallop, with the rattling of scabbards and accoutrements in his ears, the view shut out in front, and the sound impeded, while the covering and distance are to be preserved, according to a complicated arrangement, which it is difficult clearly to understand. Let him then take post as leader of a squadron, either in line or direct échelons of squadrons, with the front open for sight and hearing. If he will then state candidly which he considers the best position for an intelligent man, who is to fulfil the responsible duties of leader of a body of cavalry, in the immediate presence of the enemy, there is little doubt but that he will declare himself in favour of the latter position.

Time not sensibly increased by employing direct échelons.

One of the arguments adduced in favour of the change by oblique échelons is, that it occupies less time than when the same change is effected by the direct échelon movement.

It shall be shown farther on, that the difference in time, when the proposed change is effected by one principle or the other is so slight, that it may be disregarded altogether in practice; and that in all other points, the direct échelon movement has a decided superiority.*

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* Appendix, note 17.

CHAPTER XI.

THE MARCH IN LINE: PROPOSED ALTERATIONS.

Formation in line, or fighting order.

THE movements *en bataille*, or in line, are supposed to constitute the fighting order of the cavalry, and to be employed in the actual presence of the enemy.

Originally parallel to the enemy's alignments.

It is to be supposed that the formation will be taken up, in the first instance, fronting in the direction of the enemy or point of attack; that is to say, that the alignment will be more or less parallel with the position assumed by the enemy.

The passage from column to the line formation being freed from all the restrictions attendant upon the law of pivots, the proposed column arrangements become of so simple a character, that there can be no difficulty whatever in taking up the alignment in any direction required in the first instance.

The advance in line.

The alignment taken up, and the formation *en bataille* completed, nothing remains but to advance in battle-array against the enemy.

The advance in line, is the most important of all the movements of cavalry. So much has been said and written upon the subject, and the great importance of the movement is so generally acknowledged, that it is unnecessary to enlarge upon it here.

General principles should be retained as in our service. Outline of these principles.

The general principles for the advance in line, as found in our regulations, appear to be the best which could be devised. The squadrons may be considered to represent the units of the line formation, the directing or regulating point being the centre of each squadron. The duty of the non-commissioned officer placed at this point is simply to follow the squadron leader, preserving always the full regulated distance from him. The remainder of the squadron of all ranks look to the squadron leader, and are guided by the central regulating point, with reference to pace, interval, and alignment. The squadron leader of the squadron of direction represents the general regulating point, with reference to pace, interval, and alignment, for the whole line of squadron leaders. Upon these squadron leaders devolves the responsibility of leading their squadrons, and it is their duty to conform to any indications of alterations required in the general alignment, if during the advance such indications should be given by the moving base which accompanies the squadron of direction. Upon the leader of the squadron of direction devolves the responsibility of leading forward the whole line in the true direction.

This is an outline of the system adopted, involving the principle of the central leading in line.

Leading by centre compared with flank leading.

Leading the squadron by the centre in line has become so habitual in our service, that the English cavalry officer generally dismisses the idea of leading according to any other system, as purely a mistake; but, we may rest assured, that the flank system of leading was not adopted in other services without due consideration; but that, as in most matters of this kind, there is a good deal to be said on both sides. But the details of this discussion need not be dwelt upon here. For, in the first place, leading by the centre is the established principle in our service, and that alone ought to be a weighty reason for adhering to it; and, in the second place, the system which is proposed is founded upon the supposition that the regulating point on all occasions, and in all formations, whether in line, échelons, or column, during the change of direction, or during the movement on the direct line, shall be the central point of the moving body, with one exception, and that is, during the wheel on the halted pivot. Therefore, to give up this point would be to relinquish the entire system.

Some of the leading arguments which might be brought forward in a comparison of the two systems are as follows. The great disadvantage attending the centre leading principle is, that all the squadron leaders, with the exception of the leader of the squadron of direction, must look in one direction, and ride forward in another. This necessity of looking in one direction, and moving in another, would prove fatal in infantry movement; for a man cannot look two ways at once, and if it is incumbent upon him to keep an object at a certain distance on his flank, attentively and constantly in view, even a slight inequality of the ground, if he is not prepared for it, might cause him to stumble, and thus lose his line of leading; and while he is recovering his equilibrium, his followers will remain at fault. This principle, then, is not suited to infantry movements, and consequently is not adopted in them.

But the cavalry leader has the assistance of four eyes instead of two; the instinct of the horse will lead him to avoid or pass safely any small obstacles in his way, so that the horse will keep a look out forward, while the leader glances his eyes in the direction of the base.

Theoretically speaking, a man cannot look two ways at once, but practically, the glance of the human eye is so rapid, that by a slight action of the optic nerve, and an imperceptible turn of the head from moment to moment, a mounted man is enabled, for all practical purposes, to keep the space enclosed within a right angle constantly in view; and this is all that is necessary in the case of the leader of a squadron.

It must be confessed that the centre leading is to a certain extent attended with difficulty. If the attention of the leader is removed from the directing point, even for a few seconds, irremediable mischief may ensue, particularly if the pace is quick. Although the cavalry leader is not subject, in so great a degree as the infantry leader, to the disadvantages attendant upon movement in one direction, while the view is directed in another, still the necessity of looking to a flank during the advance, may, if not guarded against, produce an action of the muscles of the whole body, and a movement of the bridle-arm, which will communicate false aids to the horse, and render his advance, particularly at a fast pace, irksome and difficult.*

A slight change of position in the saddle, a pressure of the leg, and a feeling of the hand, should have the effect of altering the action of the muscular system throughout the entire frame of the horse. Therefore, it will not do for the squadron leader to sit sideways on his horse, counteracting the effects of this position by a strong feeling of the rein on the side opposite to that towards which he is looking. If he accustoms his horse to this mode of proceeding, he will find, when he expects him to answer the fine and almost imperceptible aids, which must be employed when using the different arms effectively on horseback, that mouth and flanks have become callous.

It cannot be denied that there is a difficulty to overcome, but it is a difficulty which may be mastered by good riding and a little attention; it is quite possible to glance the eye and turn the head slightly to a flank, without communicating the action to the lower muscles of the body, or impeding the action of the horse.

The chief cause of this difficulty in the centre leading principle, is the distance existing between the regulating points; but if we attempt to get over this difficulty, as is attempted in some services, by increasing the number of regulating points, and thus shortening the distance between them, we multiply the sources of error, and complicate the system.

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* At present, an excellent and efficient system is being introduced into our service, tending to make the men expert in the use of their arms, and individually good horsemen; tending also to bring the training of the horse to a high degree of perfection. It is to be hoped that this will put an end to the rough aids sometimes employed by the men in the ranks, almost amounting to a kick in the flank or a pull at the bridle; as each man will find out the necessity of preserving the fine feeling of both mouth and flanks in the animal he rides, if he is to compete on equal terms with his comrades in the manége.

The squadron leaders marking the centre points of the squadrons or units of the line, are at an interval from each other, equal to five-fourths of the extent of the squadron in line. It will be found in practice, that the existence of this distance from point to point requires a slight turn of the head; and the difficulty of judging the interval increases with the amount of the distance to be estimated.

When the regulating point is on the flank of the squadron during the advance, a non-commissioned officer gives an intermediate-point between the squadron leaders. This point is in front of the flank of the squadron, and in line with the leaders, in order to regulate the alignment and intervals during the advance. The place of the non-commissioned officer, who has moved forward into the line of the leaders, is occupied by a serre-file, who follows at the regulated distance, and gives the regulating point for the men in the ranks of the squadron.

In the French service the directions are as follows:—

'Les cavaliers, pour se maintenir alignés, doivent sentir légèrement la botte de leur voisin du côté du guide;' and for the leaders in front: 'les officiers doivent rester constamment alignés sur le guide particulier placé à leur hauteur, se maintenir à un pas du centre de leur peloton, et marcher bien droit devant eux, car c'est de leur alignement que dépend en partie, celui de l'escadron.'

By the introduction of the non-commissioned officer into the line of the leaders, the number of points along the general alignment is increased, and the distances between these points are diminished. As all the officers and non-commissioned officers in this line look towards the directing flank, the distance to be judged from point to point ranges between one half and once and a half the extent of front of the division in line. Therefore the difficulty attendant upon a long interval between the directing points in line, and upon keeping in view a point at a considerable distance on the flank is so far got over. But in gaining this advantage, in the first place, the responsibility of the leading no longer remains solely in the hands of the squadron leader, for the leaders have to align by the points on their flanks, and at the same time to preserve their correct positions in front of their respective squadrons or divisions. In the second place, the details of execution of the movement become complicated; and the number of links in the chain of responsibility, as regards alignment and interval, being increased, the probability of an accumulation of error in the leading is increased also; and an error in any one point communicates itself throughout the whole length of the chain. Whereas, in the simple system adopted in our service, the leading points of direction are few and far between, and any error in the alignment or the interval of the minor points, dependent upon these main leading points, does not spread beyond the particular squadron in which the error was originated.

A principle is involved in this system of flank leading, which, however well adapted to infantry tactics, appears out of place when applied to cavalry movements; namely, touching to a flank, while moving straight to the front. The adoption of this principle in the infantry is supposed to enable a man to keep his body square to the front, and preserve his dressing, without the necessity of diverting his view and attention from the point towards which he is advancing. He can, by this means, look straight to his front, and at the same time, mechanically, by the touch of his arm, retain his connection with the directing flank.

But when we come to apply this principle to cavalry movements, and require a mounted man to touch lightly his neighbour's boot at all paces, many new points arise. A man's legs would surely be much better placed when close to his horse's flanks, in order to aid and control the horse during the advance, than stuck out to either flank in search of his neighbour's boot. This action alone, at a fast pace, would be enough to sway a man in his saddle, causing him to lose his balance and position, and to throw his horse off his stride. Doubtless this principle is not intended to be carried out to the letter, but it would be better to avoid altogether the introduction of it into cavalry movements.

In the advance in line, especially at a quick pace, the effects of a loss of interval between files on the reverse flank, sometimes spread suddenly and powerfully, causing a pressure and crushing towards the directing flank; in this case the guide has to bear the whole weight of the squadron, which will most likely cause him to lose his covering, and will crush him in against the flank of the adjacent squadron. When the centre is the regulating point, the guide has only, in such a case, to bear the pressure of one-half the squadron, which pressure may be counterbalanced and opposed by the force existing in the other half of the squadron.

The great advantages of centre leading.

But the great and preponderating advantage of the centre leading is, that it is simple, and always the same. Men and horses have on all occasions to look to the centre for the regulating point; the leader is in front, within range of view of both horses and men; and, with proper attention and good riding, there is no insurmountable difficulty in preserving the interval between files in the ranks, particularly when the irritating element created by the close proximity of the rear rank is no longer in existence. The mounted man has a certain advantage over the infantry man, in preserving the interval between files, for the head and forehand of the horse of his neighbour towards the centre come, to a certain extent, within the range of his vision, when directing his glance to the point of leading; and this will serve to assist him in keeping his interval in line. The attainment of a higher degree of perfection in the training of our horses will certainly be attended with the best results; but we should also, if practicable, suit our movements to the capabilities and instincts of the horse. No system will meet this requirement so effectually as one in which the same thing is always done under the same circumstances. The instinct of the horse will lead him to follow and conform to the movements of a leader, whom he always sees in his front. Everyone is familiar with the fact, that troop horses have been known to join the ranks when their riders have been thrown or killed, and go through all the subsequent movements, merely guided by habit and instinct, and we may depend much more than has hitherto been done, upon the instinct and habits of the horse, as an assistant element in movements in the field. But we cannot expect a horse to comprehend, that, in the advance, one flank is to direct at one time, and another flank at another time, merely at the discretion of the commanding officer. We will not pursue this matter farther. The reasons in favour of an adoption of the centre leading principle greatly preponderate, and anyone, who will impartially study all the details of the two systems, will arrive at the conviction, that there is a confusion and complication in the system of flank leading, from which the other system is free.

Details for perfecting centre leading system.

The centre leading principle being admitted into the system, to regulate the advance of the line, no pains should be spared to carry it out fully in all its details, so as to render the execution of this all-important movement as perfect as possible. With this end in view, the squadron leader's horse should be perfectly trained and well adapted to his work: and the squadron leader should be able to ride, not only so as to sit in his saddle and avoid falling off, in the charge or quick movements, but so as to control his horse completely without any sensible effort; thus being able to bestow his undivided attention upon the important and difficult duty which devolves upon him. That he may be at liberty to do this, and may have full freedom of action, he must not be overridden or pressed upon by the squadron in his rear.

The non-commissioned officer placed in the centre must not only follow his movements exactly, but must keep the full regulated distance from him; and the remainder of the squadron must conform in all respects to his movements and indications, the flanks keeping well back.

The following rule in the French service bears upon this point:—

'Lorsque le guide se sent jeté hors de la direction, il étend le bras en avant pour indiquer qu'il est forcé; alors les cavaliers portent la main du côté opposé, jettent un coup d'œil sur le guide, et redressent leurs chevaux, aussitôt qu'ils ont repris l'aisance nécessaire.'

If the leader is overridden in the advance, the view of the base and line of leaders is shut out; and the officers' and leaders' horses become irritable and unmanageable. At present, if the closing-up principle is well carried out during the advance, the rear rank runs over the front rank, and the front rank over the leader. The position of the rear rank being changed in the proposed system, one of these disturbing causes will be removed.

The leader of the squadron of direction has also a most difficult and important duty to fulfil. He 'takes a point in the distance perpendicular to his front, and selects intermediate objects upon which he is to move.'* Although he may attend most scrupulously and exactly to a portion of these instructions during the advance, still, if he fails in one particular, namely, the selection of the point in the distance perpendicular to the general alignment, every step he takes in the advance will lead him farther and farther from the true line of direction.

Good provision is made for preserving the base parallel with the original alignment during the advance; but this parallelism may be strictly preserved, and still the general line of direction may be false. The true perpendicular direction is equally important with the parallelism of the base. It is a common mistake on the part of the leader of the directing squadron, to take up the line of direction, without, in the first instance, ascertaining with sufficient accuracy that his horse is placed exactly perpendicular to the general alignment; or, if the dressing is imperfect, he may be led astray by taking up as a guide only the line of front of his own particular squadron.

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* Cavalry Regulation, p. 166.

A slight deviation once occurring in this particular has a sensible effect upon the correctness of the advance, producing a crowding, crushing, and overlapping of squadrons on one flank, an opening out and extension of intervals on the other, and a general and gradually increasing unsteadiness throughout the line; and the faster the pace the more will the first mistake tell.

The arrangements adopted in the infantry, for taking up successive points in the line of direction during the advance, would of course be quite out of the question in the cavalry advance, except merely for instruction, when they might be made highly useful; but there is nothing to prevent a superintendence of this most important point from the rear of the line, especially if the ranks are single. In the French service, the first adjutant-major on the right, and the second adjutant-major on the left of the line, are charged with the superintendence and direction of this particular point.

The leader of the squadron of direction should be fully impressed with the great responsibility which devolves upon him, especially in leading a brigade, and his attention should not be diverted, even for a moment, from the all-important duty of leading the line forward in the true direction.

The retreat in line.

All that has been said with reference to the advance in line holds good with respect to the retreat. The squadron serrefiles become the squadron leaders for the time being; a squadron of direction being given, and arrangements being made for a regulating base during the retreat. The retreat of the whole body in a line formation is not, however, a movement likely to be continued for any considerable distance.

Change of direction in the line of movement in fighting order.

Here ends the advance and retreat of the line. So far the movement upon lines perpendicular to the front has been provided for; but no provision has as yet been made for a movement upon lines in prolongation of or at an angle with the original alignment, or, in other words, for a *change of direction in the general line of movement en bataille.* This seems to be the most appropriate term when applied to cavalry manœuvres in presence of an enemy; for we must not contemplate the idea of stationary resistance, or mere defensive action on the part of the cavalry, uncombined with a movement in advance of the body engaged. The effective action of cavalry is so intimately allied to movement, that in order to make or repel an attack, a body of cavalry must be previously put in motion.

The change at present referred to, when made in presence of the enemy, has generally for its object to repel or counteract a movement of attack on the part of the enemy, or else to initiate a similar movement on our own part. In both cases the subsequent movement in advance of the acting body, when composed of cavalry, is implied. Therefore it appears that a 'change of direction in the line of movement of the body acting en bataille, or in fighting order,' is the most appropriate term for the manœuvre now treated of. We thus assimilate the terms employed in the line and column movements. The term *change of direction* is applied to a change in the general line of movement of the column, and the same term may be taken to express a similar change with reference to the movements in line.

When the moving body is small, a change of direction in the line of motion is effected by the circular movement called the wheel, the reverse flank, or point describing the greatest distance, moving on a circular arc, until the required change is completed. The squadron front is generally admitted to be the maximum limit in this case, and when the front is of considerable extent, this mode of changing direction is out of the question, therefore some other means of effecting the same object must be resorted to.

Echelon movement applied to change of direction.

The means at our disposal are the column and échelon movements.

The first, unless covered and protected, is generally considered unsafe, and inadmissible as a movement in the immediate presence of the enemy.

There remains therefore only the movement in échelons; and this movement we must now consider in detail, as applied to the change of direction when in line.

It will be seen on reference to the Appendix,* that the smaller the change of direction which is effected at any one time by the wheel of the units of the échelon, the more does the movement of each unit correspond with the ordinary wheel of a single horse: for which reason each successive change should be as small as possible. The action of the bodies into which the line has been broken, during the successive changes by which the circular movement is gradually effected, may be supposed to represent the successive strides of the horse on the reverse flank in performing the wheel. The units are larger, and consequently the strides are longer; what was effected, during the wheel of the smaller bodies, by the natural action of the muscles and successive movements of the horse, must now be performed by the successive movements of the units into which the line has been broken.

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* Appendix, note 17.

The movement of all bodies of cavalry, if made with order and steadiness, must be made on lines of movement perpendicular to the front of such bodies; any deviation from this arrangement must be only temporary, and any other mode of proceeding should only be adopted of necessity, and in order to place the front of the moving body perpendicular to a new line of movement. The first thing to be done, therefore, is to place the units into which the line has been broken perpendicular to their new line of movement; and as these bodies are comparatively small, and within the admitted limit, this object can be effected by means of the circular wheel, agreeably to the rules of detail established for performing that movement.

Chief alterations proposed in the method of changing direction.

According to the present system of effecting a change of direction in line:—

1. The échelon employed is the oblique échelon.

2. The units into which the line is broken are troops or half squadrons; one-half of the required angle

being wheeled at the commencement of the movement, and the remaining half at its termination.

3. The échelon distance varies according to the degree of change required.

4. The change of direction effected at any one time varies from half right to the quarter circle.

The following system is proposed :—

1. The échelon employed should be the direct échelon.

2. The units into which the line is broken should be squadrons instead of troops, and the required angle should be wheeled at the point of intersection of the old and new lines of movement.

3. The échelons should as a rule (unless otherwise ordered) be formed at half squadron distance.

4. The change of direction effected at any one time, when in presence of the enemy, should not exceed half right or an angle of 45°.

Direct substituted for oblique échelons.

It is a peculiarity of the échelon movement, that by whatever process we form the échelons from line, we can re-form a parallel line correctly by employing the same process.

In the direct échelon formation, the regulating point of each échelon does not quit the line of movement perpendicular to the original front: consequently the line is re-formed correctly, by merely moving the échelons on such lines, into the alignment of the échelon upon which the formation is to be made.

It will be seen on reference to the Appendix,* that, in the oblique échelon formation, the distance between the lines of movement when in line exceeds the distance between the same lines when in échelons. But the extension caused by thé wheel of the échelons, when a parallel line is re-formed, is equivalent to the distance lost in forming échelons, and therefore, when again in line, the distance between the perpendicular lines of movement of the flank échelons will be correct.

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* Appendix, note 18.

So far there is no difficulty, but when we come to form the échelons by one process, and to re-form a line at an angle with the original alignment by the other, the case is altered.

In the direct échelon formation, if we wheel the échelons into line, there will be a general extension of the line. In the oblique échelon formation, if there are no intervals between the échelons when in line, it is evident that the échelons must overlap each other more or less, and consequently a line formation by means of the direct movement is impossible; and if such intervals do exist, the line formation will only be possible, when the aggregate amount of all the intervals equals or exceeds the difference between the distance of the flank line of movement in line and the distance of the same when in échelon. We find, therefore, that we can always re-form a line parallel to the original alignment, from either direct or oblique échelons, by the same process by which the échelons were originally formed from line. Also, we can in all cases form a line oblique to the original alignment from direct échelons by the wheel of the échelons into line, but there will be an extension of the line, dependent upon the amount of the angle wheeled, or, which amounts to the same thing, upon the distance in échelons.

The formation from oblique échelons by the direct movement is only possible in the event of there being intervals between the échelon units when in line; and, when the movement is possible, there will be a diminution or contraction of the general extent of front of the line, dependent upon the amount of the angle wheeled from line into échelons.

The following passage on the subject of échelon formation is taken from Colonel S. L. Macdougall's 'Theory of War:'—

'The échelon formation combines to a certain extent the advantages of the line and column; for mere changes of position the movement in oblique échelon saves much time; for an advance against an enemy in position, the direct échelon formation presents advantages afforded by no other; it combines the greater correctness of the march in column with the superior force for collision of the line.'

In infantry movements, especially when the lines to be moved are of considerable extent, the saving of distance, and consequently of time, is a matter of the utmost importance; for we have not the power, as in the cavalry, of compensating an increase of distance by an increase of pace, and even a slight additional exertion previous to coming into action may tell sensibly and unfavourably upon the men; consequently the exact amount of distance described in executing any movement becomes almost the paramount consideration. The rate of pace in infantry movement being comparatively slow, the spaces of time corresponding to even short distances become of importance.

The oblique échelon formation also is better adapted to the methodical movements of the infantry, precision and exactness being their distinguishing characteristics.

When great precision, in the matter of bases, covering, distances, intervals, and wheeling, can be attained, and when all the arrangements necessary for this purpose are not liable to be thrown out by the many disturbing causes attendant upon the rapid movements of cavalry, the great advantages attending the oblique échelon formation, which are enumerated in our cavalry regulations, become a reality in practice. But we must deal with the tactics of cavalry in a different spirit. The attempt to attain great precision must be to a certain extent relinquished, and we must be content to supply its place by rapidity and simplicity in all our movements.

The objections to the oblique échelon formation of troops, when applied to cavalry movements, have already been stated, and need not be repeated here; only let this be remembered, that all the advantages attending the oblique échelon formation, which are so well described in the passage quoted, belong in a superior degree to the direct échelon formation.

There is only one point in which the oblique movement seems to have an advantage over the direct, viz. that by adopting it we save a certain amount of time and space.

In cavalry movement this matter is not really so all-important. As we have three different rates or velocities at our disposal, which we can vary and combine at pleasure, we possess a ready means of compensation, if we should consider it requisite to increase the distance described in effecting a formation, in order to gain some desirable advantage.

But as some persons seem to think that in all movements, whether of infantry or of cavalry, the saving of time and space is the paramount consideration, and that the degree in which this saving is effected should be taken as the test of the superiority of one movement over another, we will now examine the matter, in order to ascertain what is really the amount of time and space saved in a change of front, half right or left, by adopting the oblique instead of the direct échelon formation.

The distance to be considered is the distance described by the reverse flank of the line during the change; and the time required to complete the movement is the time occupied in describing such distance at the pace employed. By a reference to the Appendix, it will be found that, taking as an example a regiment of four squadrons of 48 files each, the difference of the distances described by the reverse flank in a change of front 'half right or left,' when the direct échelon is employed instead of the oblique échelon, does not exceed ten yards.* The time occupied in passing this distance at the walk would be 5 seconds, at the trot 2·5 seconds, and at the gallop 1·3 seconds. In the case of a brigade of two regiments these times would be doubled, in the case of a brigade of three regiments trebled, and so on.

If we watch the second hand passing over the space which indicates the number of seconds stated, and thus realise the amount of the time lost or saved, it must be admitted that the saving of so small an amount of time, and a few yards of space, should not for a moment be put in competition with the great advantages obtained by the adoption of the direct échelon, a formation so eminently adapted in all respects to the movements of cavalry in presence of an enemy.

Even this small saving of time is, in fact, more apparent than real. Many more seconds will probably be lost in rectifying the disorder occasioned by employing the oblique movement than are gained by its adoption.

This objection, on the score of loss of time, to the direct échelon movement, is therefore disposed of, at least with reference to cavalry movements. In all other matters Colonel Macdougall gives a decided preference to the direct échelon formation. He says:—'For an advance against an enemy in position, the direct échelon formation presents advantages afforded by no other.'

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* Appendix, note 19.

This is especially true with reference to cavalry. An attack of cavalry in direct échelons at short distance, if not actually equal to an attack in line, is very little inferior to it.

The advantages of this formation will be found described in the paragraphs of Colonel Macdougall's work, succeeding the one I have quoted: and although he more particularly contemplates the movements of large bodies of all arms, much that is true and useful in relation to cavalry brigade and regimental movements may be collected from his work.

In direct échelons of squadrons the front is clear; and each squadron is free to act, in case of a sudden attack, direct to its own front. In oblique échelons of troops this is not the case, the échelons overlap, consequently the front of each échelon is not clear, and the view of the leaders is obstructed; an attack in an oblique échelon formation of troops may therefore be considered an impossibility.

Being in presence of the enemy we should not even for a moment quit a fighting order, if it is possible to preserve it. If there should be no time to form, or only time for a partial formation, if formed in direct échelons, we can attack in échelons, or part in line and part in échelons; but the oblique échelon formation would be found ill-adapted to meet such a contingency. In direct échelons of squadrons, the movement of each squadron is simply straight to the front, requiring only the application of the rules of execution necessary in the advance in line; the squadrons dress by the centre and follow the leader, the only difference being that the centre line of movement of each squadron is prolonged to the rear by the position of the marker, in order to enable the squadron leaders to judge the interval. The central points moving upon perpendicular lines, upon which the whole system hangs, still remain the regulating points.

So long as the interval between the lines of movement of these points is correctly preserved, an error in alignment or interval does not spread beyond the squadron in which it occurs.

In the oblique échelon of troops, the arrangements for preserving the alignment and intervals are temporarily altered, and those adopted are objectionable for more reasons than one. The number of units of the formation, and the regulating points for intervals and distance, being many, the sources of error are many also. An error in any one part spreads, and communicates itself throughout the system, as there are no general regulating points to check an accumulation of error.

The great advantage supposed to attend the oblique échelon movement is, that 'it enables a body to change front or position either on a fixed or moving point, retaining the power at any moment to stop the movement, form a line, and repel an attack.'* Certainly we have the power to stop the movement in oblique échelons at any moment, and form a line parallel to the original alignment by wheeling the échelons into line, if the intervals and distances have been strictly preserved during the previous movement in oblique échelons; but the great difficulty of preserving interval and distance correctly forms one of the chief objections to the movement in oblique échelon of troops.

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* Cavalry Regulations, p. 159.

If anyone who has a strong belief in our possession of this power will take command of a line of cavalry of considerable extent, throw them into oblique échelons with a view to changing front or position, sound the gallop, and when the line formation is partially completed, suddenly and unexpectedly give the order to the portion still in échelon to wheel into line and charge, his faith is sure to be shaken; or at least he will come to the conclusion that, in order to use this power with effect, the troops we have to work with must have attained a high degree of perfection in the execution of their field movements.

When working in direct échelons we really do possess the power of stopping the movement at any moment, and forming an effective line; and if the squadron leaders and markers only know their work tolerably well, and the men dress to their centre, keep the flanks back, and do not run over the leaders, the formation should be made at all paces with perfect steadiness.

As already said, the front of each squadron is clear, the sound of words of command or of signals is unimpeded, the view is unobstructed, and the leaders can see their work before them. No principle is involved, except that belonging to the simple advance by central regulating points, moving on lines perpendicular to the front; and if cavalry have reached even a moderate degree of perfection in their training, they ought to be able to make this simple movement of advance, required in each squadron, without confusion or disorder at all paces, and to be prepared for an attack immediately after.

But the greatest advantage attending the direct échelon formation is, that should there not be time to complete the line formation, we can attack with effect in échelons.

There is another point to be considered, in comparing the merits of the direct and oblique formations, with reference to their capabilities of meeting a sudden and unexpected attack, while engaged in effecting a change of direction in the general line of movement.

Advantages of direct échelons in case of a sudden attack.

In deciding upon the best formation for meeting a sudden attack during the change, we should consider from what quarter it is most probable that such an attack would be made.

Supposing, in the first instance, that the positions of our own and the enemy's forces are parallel; if we decide upon changing the line of direction, or, in other words, changing the front of our line, it will most likely be because the enemy is moving away in force to our flank, and we think it probable he may intend an attack in that quarter.

If we are right in our conjectures as to the point of attack, and have full time to complete the intended change, we can move forward to meet the attack in a line parallel to that of the enemy, and on lines parallel to his line of attack, and shall be equally well prepared to meet him, no matter by what formation the change has been effected.

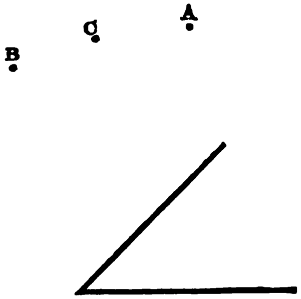
But if we find that, although we have been right as to the quarter from which the attack is to be made, we have miscalculated the time, and that the enemy is upon us sooner than we expected, then, if performing the change by means of the direct échelons, from the moment that the squadrons have wheeled into the new direction, we can charge at once in short échelons of squadrons, if there is no time even for a partial formation; and if there is part formed in line, we can charge with one flank slightly refused in direct échelons at short distance. When we consider that, in the advance, we leave to a certain extent on our flank the position lately occupied by the main body of the enemy, where a portion of his force may still be remaining, there may be reasons for preferring this formation to the completed line formation.

Upon the supposition just made, if we have employed the oblique échelons to effect the change, we can charge with the portion of the line already formed, but in doing so we shall most likely find ourselves outflanked. The remainder of the force is for the time being perfectly helpless, scattered about the field in troops; for if these wheel into line, the enemy takes them in flank, and they cannot attack in the right direction without riding over each other, until they have in their turn completed the line formation in the new direction, when they can act in support of the attacking line. According to the present supposition, however, before this formation can be completed the enemy will most probably be amongst them.

Let us now suppose a second case.

The movement of the enemy in the direction of our flank may have been only a feint, to draw us into making a corresponding change in the direction B (fig. 43), and when we are in the act of formation, he may suddenly come down upon us from an intermediate point, C.

Fig. 43.



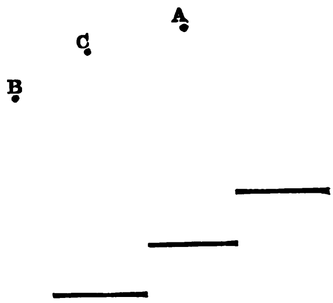
If formed in direct échelons, we have in such a case only to wheel into line and charge to the new front at once, with slightly increased intervals between squadrons, but in all other respects formed in line with perfect correctness.

Under the present supposition, if in such a case we are working in oblique échelons of troops, we are powerless. If we wheel into line, we are attacked obliquely, and our flank is exposed to the enemy, who has gained upon us in that direction. If a portion of the new line is formed, it is taken in flank, the troops composing the échelons overlap each other, and therefore we are precluded from forming in the true direction of the attack.

We will now suppose a third and last case: namely, that the movement of the enemy to a flank is only partial, and intended to draw us into breaking up our force into smaller bodies, in order to effect a change of front or direction; and that, while we are in process of a new formation, he attacks from the direction of his original position, or, as is most probable, combines this direct attack with a flank attack by the part of the force which he has managed to move to the flank.

Under this supposition, if we are formed in direct échelons of squadrons at short distance, we have only to meet the direct attack by forming line and charging, or by charging in échelons, or part in line and part in échelons, as circumstances may dictate and time permit.

Fig. 44.



As to the flank attack, if made from the direction of C, we have only to wheel into line one, two, three, or four squadrons, in proportion to the force employed in the attack, and charge in that direction; or if made from the direction B, we have only to wheel the squadrons to the flank the required degree of wheel, form line and charge, or charge in échelons; or if attacked both from the directions C and B, a combination of the two movements last mentioned will meet the contingency: but this is supposing rather an extreme case.

If, under the same supposition, we are in oblique échelons of troops, we can wheel into line and repel the direct attack, if the distances and intervals have been strictly preserved; if not, the charge will be disorderly and most likely ineffective.

As to the flank attack, if it is made from the direction C, we can only meet it with a single troop; for, as has been already shown, the troops overlap and cannot form in that direction. Of the remainder, both the portion already formed in line to the new direction, and the portion advancing to the attack in the old direction, will be taken in flank.

If attacked in the direction B, we can meet the attack with the portion of the force already formed in line in the new direction; but the force of the enemy being superior, the whole of his force being disposable to attack part of ours, we shall be outflanked, and the portion of the échelon wheeled into line will be taken in flank, unless the flank attack is completely paralysed by the attack of the line formed in the new direction.

These three suppositions of cases, which may be reasonably supposed to occur, have been made in order to compare the relative merits of the two descriptions of échelons, when a sudden and unexpected attack is made. It is represented that the chief merit of the oblique échelon of troops consists in its capability of meeting such a contingency; but every examination of the question tends to confirm the proposition that the direct échelon formation should be adopted in preference to the oblique formation; and any impartial enquirer must admit that the advantages attending the direct formation greatly preponderate, at least as far as cavalry movements are concerned.

Échelon units to be squadrons instead of troops.

The second proposed alteration is, that the units into which the line is broken should be squadrons instead of troops.

The squadron has generally been taken to represent the maximum limit of those bodies, the units of which, while describing parallel lines of movement during the wheel, are represented by single horsemen in the ranks.

From the nature of the movements proposed, it is evidently necessary that the units into which the line is broken should be capable of performing the circular movement called the wheel, without being further subdivided; but this point being secured, the larger the unit selected the better; for when acting in line or *en bataille*, we are supposed to be in the immediate presence of the enemy, and therefore the units into which the line is broken should be capable of acting independently, and fighting their way if driven to extremity, or separated accidentally from the main body.

We have only to study the history of the past, or the records of the passing time, to convince ourselves, that, even when acting single-handed and unsupported, squadrons are capable of performing wonders.

The squadron in each rank, when formed according to the rank entire system, may be said to be self-contained. It has its own leader, its own officers, its own trumpeter, marker, &c. The men have lived, messed, and been drilled together, the horses have been stabled or picketted together, and they ought not to be separated when working in the field.

Another reason for selecting the squadron as the unit in the échelon formation is, that the *intervals* existing between squadrons when formed in line give us a greater latitude in executing the different formations, than we should possess if the units were component parts of the squadron, as in the present system.

It has already been shown, that if we advance in direct échelons from a flank at half-distance, and wheel into line in order to repel a sudden and unexpected attack, there will be a slight extension of the line, producing intervals between the ranks of the échelons when wheeled into line; or if intervals previously existed between the échelons in the original line, producing a slight extension of such intervals.

Intervals between troops or other component parts of the squadron, when wheeled into line, would tend to produce disorder and unsteadiness in the subsequent advance and attack, occasioned by the closing in of the separated parts of the squadron; but a very slight increase in the intervals between squadrons ought to produce no unsteadiness whatever; on the contrary, when the extension does not exceed certain limits, it only gives greater freedom of action throughout the line.

The regulated interval between squadrons in line is equal to the extent of front of a peloton or division, that is, to one-fourth the front of the squadron. Long usage has established this proportion, and it is a convenient standard of measurement. An interval much more extended would separate the squadrons too much from each other, and a smaller interval would not allow sufficient freedom in movement.

It is now generally admitted that there should be intervals between the squadrons in line, and that these intervals should be sufficient to allow perfect freedom of action in the squadron at all paces, without destroying the unity of action throughout the general line. But there is no particular charm attending the proportion of one-fourth; and although it would not be right to increase or diminish this proportion permanently to any great extent, an alteration of a few yards under particular circumstances, and that only temporarily, cannot be of vital importance; in fact, we cannot, even under the most favourable circumstances, calculate upon the intervals being so correctly preserved, that there shall not exist an error of a few yards here and there.

The movement involving an alteration of interval would only be employed in case of a sudden and unexpected attack; but when employed, it would be much better to attack, with intervals very slightly increased, all the squadrons moving straight to their front, than attempt to rectify the intervals on the move by the incline or otherwise, which would

probably produce wavering and unsteadiness at a critical moment.

Échelons to be at half-squadron distance.

The third proposition which was made is, that the échelons should, as a rule, be formed at half-squadron distance. In the first place, the échelon distance being always the same, there can be no mistake or hesitation about that particular; it will only be necessary to indicate the flank or portion of the line from which the échelon is to advance.

If, for any special purpose of parade, for the passage of lines, to leave room for the squadrons to wheel the quarter circle to a flank, or for other reasons, it may be desirable to increase or diminish the distance, a particular caution can be given to that effect; but what is now proposed is, that when acting in presence of the enemy, if no such caution is given, but merely a signal or order to advance in échelons, it shall always be understood that the échelon intended is direct échelons of squadrons at half-distance. A reference to the Appendix on this subject will show, that if any number of squadrons, formed in direct échelons at half-squadron distance, are wheeled into line, the angle wheeled is one-sixteenth of the circle (22° 30′),* and consequently that the wheel of one-eighth of the circle (45°) will place the squadrons again in direct échelons at half-distance, the leading échelon and general front of the formation being changed during the wheel.

One-eighth of the circle (45°) expresses the greatest

angle which it is proposed to wheel at any one time, in effecting any change of direction which may be required in presence of the enemy; consequently the direct échelon at half-distance is peculiarly well-adapted to the purpose.

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* Appendix, note 20.

The échelon is thus formed at a comparatively short distance, at the same time that ample room and freedom is given for movement at all paces. The proximity of one squadron to another will facilitate the preservation of intervals and distance, and the échelon thus formed should move with perfect steadiness at all paces and under all circumstances. The distance between squadrons being short, the line formation will be quickly effected by the direct movement; and the formation of the échelons at half-distance will also facilitate the execution of a simple and useful movement, generally called reversing the échelon, that is to say, bringing the rear of the échelon to the front by a forward movement on direct lines, and thus changing the leading of the échelons.

Angle wheeled at any one time not to exceed 45°.

The fourth proposition is, that the angle wheeled at any one time, when in presence of the enemy, should not exceed half right, or an angle of 45°.

Let us, in the first place, examine a little in detail the circumstances under which this movement is required.

We are told, that the march in line or *en bataille* ‘is requisite near the enemy, and immediately precedes the attack,’* and from this point of view we must consider it.

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* Cavalry Regulations, p. 166.

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Angle wheeled at any one time not to exceed 45°.

The fourth proposition is, that the angle wheeled at any one time, when in presence of the enemy, should not exceed half right, or an angle of 45°.

Let us, in the first place, examine a little in detail the circumstances under which this movement is required.

We are told, that the march in line or *en bataille* 'is requisite near the enemy, and immediately precedes the attack,'* and from this point of view we must consider it.

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probably produce wavering and unsteadiness at a critical moment.

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The third proposition which was made is, that the échelons should, as a rule, be formed at half-squadron distance. In the first place, the échelon distance being always the same, there can be no mistake or hesitation about that particular; it will only be necessary to indicate the flank or portion of the line from which the échelon is to advance.

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If we examine the matter closely, we shall find that there is a complete analogy in many points between the individual combat and the combat of disciplined troops opposed to each other in fighting order.

Take the most simple of all combats, that in which no weapons are used, but simply the means of attack and defence provided by nature. If one man attempts to change his ground and gain the flank of his antagonist, when within distance, the moment he raises his foot to effect this purpose, his opponent has only to attack, letting out his left, or left and right if he thinks it will be better. He takes his antagonist at a weak moment and in a bad position, and in all probability the results will be satisfactory.

A man must make his change before coming into distance, or else he must get out of distance before he attempts to make the change; and this holds good when bodies of troops are drawn up in battle array against each other. If the enemy should attempt to alter his position while within charging distance, we have nothing to do but to ride at him, and take him in his moments of weakness, and in a helpless state of transition from one formation to another; consequently the only case we have to contemplate is that in which the enemy makes his change of position out of charging distance, and consequently at a certain distance from our line.

Taking this view of the matter two cases may occur.

1. The enemy may change his position with an

intention of gaining our flank, necessitating a corresponding and counter movement on our part.

2. We may take the initiative, and attempt to gain the flank of the enemy.

In the first case, as it is to be assumed that the first position of the enemy is at a certain considerable distance from our line, he, in changing to a position on our flank, evidently moves upon exterior lines, while we, moving on interior lines, make a counter-movement, and take up a corresponding attitude by a simple change of direction in the general line of movement.

The enemy moving on such exterior lines, in order to take up a position to our right or left front, must either compromise himself by moving to do so within distance; or else must make a considerable circuit, leaving us ample time to make our change of direction, half right or left, by the means proposed for affecting it.

If the enemy continues his circular movement to the flank—and a circular movement it must be if he keeps out of distance—so as to take up a position directly on our flank, we shall have ample time for a second change, and for a third also if necessary. But this is supposing rather an extreme case; for it is not a fair supposition, either in the individual combat, or in the combat of opposing bodies of troops, that the enemy is to appear at one moment in front, at the next on our flank, and then in our rear, leaving no time for counter-movements. If we meet with an enemy who can do this we had better quit the field at once, and leave the matter in the hands of the infantry, who can throw themselves into squares, and form in all directions at the same time.

The point to be established is this: the change of direction or front, which it is necessary to consider in all cases likely to occur, when moving *en bataille* or in fighting array, need not exceed the half right or left, or an angle of 45° at one time, of course to be repeated if necessary.

The second case to be considered is that in which we take the initiative, and attempt to outflank the position of the enemy. The case is now reversed; we have to make the circular movement on the exterior lines, while the enemy has the power of moving on lines interior to our lines of movement.

To return to the individual combat, if one man draws up his fist to his shoulder, and doubles himself up to strike, one of two things will most likely happen: either his opponent, seeing this signal of attack, will put an end to these preliminary arrangements by striking out himself, or else knowing perfectly what his antagonist's intentions are, he will be quite prepared to parry any attack, the preparations for which are made in so clumsy a fashion.

The approaches to an attack, if it is to be effective, must be made by degrees; a point of vantage must be gradually and imperceptibly gained, from which the transition to a position to strike shall be so rapid and unexpected that there shall be no time for a counter movement: or, what is perhaps better still, the drawing back of, or action of preparation to strike with, one hand, should be simultaneous with the action of striking or parrying with the other, by which means a successful attack can be followed up, or an unsuccessful one remedied by a second attack, at the moment when the enemy is thrown temporarily off his guard.

The analogy holds good in this case also: we must not show a signal of our intentions, by moving away bodily to a flank in column, or giving other unmistakeable indications of what we are going to do; but the change required must be made gradually, imperceptibly, and on the move, until we gain a point from which a sudden and slight change will bring us into a position and formation to strike: or else, while we either attack or threaten with one portion of the force, we must gradually and imperceptibly effect the change in the position of the other, which will enable us to attack the enemy when thrown off his guard by the first movement.

For manœuvres of this description, the change amounting to 45°, which can be made on the move or otherwise, and without any confusion or difficulty, will be found eminently well-adapted.

Having now established that, when moving *en bataille* and in presence of the enemy, the change of front or direction, amounting at any one time to 45°, will be sufficient, this change being of course repeated as often as required, the details of execution of the movement shall be given in another chapter.

CHAPTER XII.

DIRECT ÉCHELONS.

Position of squadron marker. It is proposed that in direct échelons of squadrons, all ranks should occupy the same positions they occupy in line, with the exception of the squadron marker, who takes up half-squadron distance in rear of the centre of the adjacent squadron towards the directing hand, (making a slight allowance of 20 feet, or about 7 yards, for the depth of the rank and the position of the squadron leader in front of his own squadron), and takes up the line of covering of the squadron leader, his coverer, and the squadron serrefile; these three being on the centre line of movement of the squadron, which line the marker thus prolongs. The rank being single facilitates this covering.

Covering, distance, &c. The interval will be judged by the squadron leaders, between the central lines of movement of adjacent squadrons, as in line; the only difference being that the squadron leaders take their intervals from their own marker, instead of from the leader of the adjacent squadron towards the squadron of direction.

The squadron markers ought to have no difficulty in preserving their correct covering and distance. The distance is short, and the squadron in front should be an assistance, enabling each to measure the half-squadron distance by the eye. The distance being, except under special circumstances, always the same, the markers would soon become sufficiently accustomed to it to take it up and keep it with great exactness.

The squadron leader will have no more difficulty in judging his interval than when moving in line; on the contrary, the proximity of the squadron immediately in front may be an assistance to him.

Central moving principle adhered to.

The central moving principle, as in line, is adhered to; for the preservation of a few main regulating points is a much better plan than multiplying points and shortening intervals. The glance of a correct eye, taking in a distance the estimation of which has become habitual, is much more to be depended upon, than the preservation of correct intervals between the files of half a squadron, which may be sensibly affected by the rapidity of the pace, or unsteadiness of the horses.

Extension of échelon distance.

If the signal to extend the distance be given while the échelon is on the move, the leading squadron takes up the increased rate of pace ordered, and each squadron in succession takes up the same pace as the full distance is gained. The marker of each squadron preserves the original pace, until the full distance (the squadron front and interval) is gained, when he takes up the increased pace; his movement serving as a guide to the leader of his own squadron.

If the movement is performed from the halt, each squadron moves off in turn as the full distance is gained.

Closing up the échelon distance.

Should the signal be given to close the distance, if on the move, all the squadrons increase the pace with the exception of the leading squadron; the markers resuming their usual places, and each squadron in succession taking up the pace of the leading squadron, as soon as the leader finds himself in the alignment of the serrefile rank, when he takes his interval from the serrefile of the squadron on his flank towards the directing hand.

If done from the halt, the whole move forward, with the exception of the leading squadron, and the squadrons halt in succession upon reaching the above distances.

Wheel of squadrons.

In the wheel of squadrons, if the movement is made from the halt, the wheel should be made at the rate ordered ; or, if on the move, at the rate of manœuvre at which the échelon was previously moving. There should be no hurry or increase of pace whatever, but the reverse flank should preserve the correct rate of manœuvre throughout the wheel.

The guides on the reverse flanks should look to the squadron, which is to lead upon the completion of the wheel, for pace, and regulate their movements so as to preserve the échelons parallel during the wheel, and so that the squadrons composing the échelons shall arrive in échelons at any given angle, as well as in column or line, at the same moment.

The guide on the wheeling flank has a most responsible and rather difficult duty to perform, and he should give all his attention exclusively to its execution.

He should know how to ride, should possess good eye-sight, be able to judge a short distance, know his work thoroughly, and be mounted on a well-broken and active horse.

It is most important that the guide on the reverse flank of the leading échelon should give the pace steadily and correctly; and consequently it is desirable that the true cadence and stride shall have become habitual to the horse, and that the man, from constant practice, shall be able to judge the rate with sufficient exactness. Even a little practice does wonders in this matter.

The wheel of the squadron is a most important movement, and should be constantly practised at all paces. If the rate is strictly preserved without variation on the wheeling flank, the movement should be made with perfect steadiness at the gallop.

Formation in line.

The formation in line from direct échelons, by the direct movement, involves nothing more than the application of the principles already described, adapted to the movement of the squadrons in direct lines, either in échelons or in line.

If the formation is effected on the move, either the rear squadrons increase, or the leading squadron slackens the rate of pace, till the alignment of the squadron of formation is attained.

If made from the halt, the squadrons halt in succession as the alignment is reached. This movement also, if sufficiently practised, should be made with perfect steadiness at all paces.

Reversing the échelons.

This movement of reversing the échelons also involves nothing more than the application of the principles of the movement on direct lines. If performed from the halt, upon the signal to commence the movement, the rear squadron moves straight to the front; the next squadron moves off when the correct distance has been gained from the squadron in movement, and so on in succession. The marker, as usual, serves as a guide to the squadron leader of the adjacent squadron. When performed on the move, upon the signal to commence the movement being given, the rear squadron of the échelons takes up the increased pace ordered; the next squadron takes up the same pace when the correct distance has been gained, and so on in succession.

Combination of the above movements.

We have now disposed of the execution of the minor movements, the combination of which is to effect the different changes required when working in direct échelons.

The working of a body of cavalry in the field may be compared to the action of a piece of mechanism, the motive power of which is the human will, guided and controlled by the directing power possessed by the conductor of the movement, the lines of motion being circular and direct. There are certain difficulties belonging to the working of machinery which involves as elements human reason and animal instinct; but there are also attendant advantages; and the problem to be solved is how best to seize upon the advantages, and to overcome the difficulties.

In all mechanical arrangements it is necessary, in the first place, that the component parts of the machinery should work smoothly. If the wheels do not revolve correctly, and if the power or action producing the direct or circular movements is irregular and uncertain, the machine will not work when put together, and when the combined action is required.

By adopting the central leading principle, and rejecting the oblique échelon movement by troops, we have gained the following advantage: the correct working of the machinery is dependent upon the action of what is comparatively speaking a very small number of main regulating points, acting according to a simple arrangement upon direct lines of motion. Their movements are regulated and connected together by a contrivance, the action of which cannot be disturbed by error in the working of the subordinate portion of the system of mechanism adopted. The minor parts of the machinery may be temporarily out of gear; but as long as the main regulating principle, upon which all the rest depends, represented by the movement of the centre leading points of each squadron upon perpendicular and parallel lines of motion, remains undisturbed in the regularity and correctness of its action, so long does the system possess an inherent corrective principle, a compensating power within itself, which will preclude the accumulation of error beyond a certain limit, represented by the extent of front of the squadron.

We can now put the component parts of the machinery together, in order to ascertain how they worl when combined, and applied to the change of directio in line by means of the direct échelon movement.

The movements now at our disposal, perfection i the execution of which is supposed to have been previously attained by constant practice, are as follows :—

1. The formation of direct échelons from line, anc vice versâ.

2. The wheel of the squadrons.

3. Reversing the échelons.

Change of direction to the right or left.

We shall suppose a body of cavalry formed in line and that it is required to change the direction of th general line of movement to the right.

The signal will be given that the movement is t commence from the left.

Then, to advance in échelons.

Then, the pace.

Then, the signal of execution, upon which the lef squadron of the line commences the movement.

The signal that the next movement is to be to th right will then be given.

When the whole are in échelons, the signal to whee will be given, upon which all the squadrons commenc to wheel to the right together, without in the leas altering the pace.

When again arrived in échelons at half distance, having in the interim wheeled into line with intervals less than once-and-a-half the true interval, the signal will be given to form line, upon which the leading squadron halts and the remainder form line.

The same movement repeated will carry the line all round the circle, halting at each change of 45°.

To wheel the line on the move, or perform the change of direction on the movable pivot, both flanks continuing in motion.

The signal indicating 'Left' will be given as before.

Then, to form échelons.

Then, the pace.

Then, the signal of execution, upon which the left squadron of the line commences the movement.

The signal 'Right' will then be given, and when the whole are in échelons, the signal to wheel will be given.

Having again arrived in échelons at half distance, the signal 'Advance' will be given.

The signal to reverse the échelons will then be given.

During this movement the signal 'Right' will be given, and when again in échelons at half distance, the signal to wheel will be given, &c.

This movement continued will evidently carry the line all round the circle, on the principle of the movable pivot.

The times occupied and the distances described in performing each of the movements, by the combination of which the change is effected, will be found on reference to the Appendix; and these times or distances respectively added together will of course give the time occupied, and the distance described during the change required.*

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* Appendix, note 21.

It will be observed that throughout the entire movement the échelon is well in hand, and under the control of the officer commanding. The échelons being once formed, the movement to the front in échelons may be continued, until the point at which the officer in command considers it necessary to make the change is reached. He has then simply to give the signal to wheel. If silence is preserved in the ranks this signal should be heard from front to rear, even when the squadrons are numerous, when the artillery is working with the cavalry, and when the pace is rapid; for the space in front of the échelons is open, and the transition of sound is unimpeded.

If necessary, the signal may be repeated, but, even if from any accident it should not be distinctly heard by the rear squadrons, the view of the front of each squadron is uninterrupted, and, having seen the wheel commenced by the leading squadrons, everyone concerned will know at once what is to be done.

When moving in brigade, if the squadrons are numerous and the depth of the échelons considerable, the whole might be halted for a moment previous to commencing the wheel.

When again in échelons, it will be at the discretion of the officer commanding to continue the movement to the front in échelons, till the point is reached at which he may think the formation should be effected. A simple word or signal to form will then be sufficient; and even if this is not distinctly heard by the rear squadron, on account of the rapidity of the pace, the noise of the artillery, the wind, or any other cause, a failure in this respect will not in any way affect the steadiness or correctness of the movement. The rear échelons have no change to make; they simply continue the forward movement, every man in the squadron moving by his centre, the leader and marker preserving the correct interval and distance until they actually arrive in line with the squadron of formation, when there can be no longer any doubt as to the movement intended.

The great advantage attending the proposed system of formation from either column or échelons is, that it is only actually necessary for the commanding officer to communicate his intentions to the leader of the leading rank in échelons or column. If there is any failure or delay in passing or understanding the signal or word, it will not in the slightest degree affect the general steadiness of the movement. The leaders of each rank have always the same thing to do, whether a formation is taking place or not, namely, in échelons, to move straight to the front; and in column to follow the general line of movement of the column, till they actually arrive within view of the formation taking place, and see at once what is intended.

One fruitful source of unsteadiness in cavalry movement, when a quick pace is attempted, is the noise and confusion produced by the rattling of the arms, the galloping of the horses, the firing of the artillery, the shouting of separate words of command to different bodies, all which tend to prevent the word of command, or even the trumpet signals from being heard or distinguished.

Under the proposed arrangements, the change of front or direction can be made in perfect silence, as far as regards shouting and trumpet sounds, with the exception of the signal to wheel, and the signal to move forward when the wheel is completed. Not a word should be spoken in the ranks by either officers or men, but their attention should be devoted exclusively to their own particular duties.

Points to be especially attended to.

The first point to be attained is correctness and steadiness in the échelon movement. This is to be acquired by the leaders and markers preserving their intervals and distances correctly, and by the men in the ranks riding straight to the front, moving by the centre in each squadron, and keeping well back from their leaders. If the squadron leaders are pressed upon, particularly at the fast paces, there is an end to correct intervals.

The second point to be attained is the steady and correct wheel of the squadrons, without any increase of pace, the wheel commencing throughout the whole formation of échelons at the same moment, and terminating also at the same moment. All this is to be gained by constant practice, good riding, and proper training of the horses.

Nothing is here involved, but the same simple principle which pervades the whole system, namely moving by the centre, following the leader, and doing the same thing always under the same circumstances.

It shall now be shown how the single movement from line, just treated of, may be effectively employed in presence of the enemy, without making use of other more complicated manœuvres.

Application of the movement in direct échelons.

We have supposed two cases :—

1. When our movements are made to correspond with the movements of the enemy.

2. When we take the initiative, and attack.

For the sake of simplicity let us suppose our own and the enemy's initiatory movements to be made to the right. If made to the left, all that is stated will of course hold good, only substituting right for left, and vice versâ.

Let it be supposed, in the first place, that the forces opposed to each other occupy parallel positions, and that the enemy commences a circular movement to his right, apparently with the intention of turning our left flank.

When made to correspond with the enemy's movements.

The comparison already made between the movements of troops opposed to each other, and the individual combat, still holds good. If we see our antagonist shifting his ground to our left front, we must make a corresponding change by bringing up our right foot, or by retiring our left. This is followed by a slight circular movement, or change of attitude, which may be supposed to correspond to the wheel of the squadrons in échelons. There is consequently a single moment, during which we are not in the best possible position to receive or make an attack; and if we were within distance, this single moment of weakness might prove fatal, if our enemy was quick enough to take advantage of his opportunity. But we are out of distance, and a quick and almost imperceptible movement places us at once on our balance, in a correct position, ready for attack or defence. As, in the individual combat, the movement of the legs, and the correct balance of the body, enabling us to take up positions of attack and defence rapidly, and to retain our balance and power to act at critical moments, is of equal importance with the action of the arms in striking or parrying, so the preparatory action of troops, which by a simple and rapid movement places them in an advantageous position to act, is of equal importance with the actual movement of attack.

Having formed in direct échelons at half distance, the right leading, if the enemy should only make a very slight change of position and then attack, we have only to wheel into line and meet him halfway, for which there is ample time. The wheel into line, making every allowance, would occupy only—

At the Walk, 10 seconds.
„ Trot, 5 seconds.
„ Gallop, 3 seconds.

We should have to attack with slightly extended intervals, but this would be of little consequence, and would be only necessary to meet rather an extreme case; for the probability is that the enemy would continue his circular movement round to our left front. We should in that case remain in échelons watching his movements, instead of wheeling into line, until we felt satisfied of his intention. We should then wheel the squadrons half left, which changes the leading of the échelons.

If the enemy showed a disposition to attack, having reached the left front of our original position, we have only to form line by the direct movement, which in this case will be at the correct intervals, and attack, or to charge in échelons if time presses.

Taking, for an example, an échelon of 4 squadrons of 48 files each, the line will be formed in this case,—

At the Walk, in 36 seconds.
„ Trot, in 18 seconds.
„ Gallop, in 12 seconds.

If there are no symptoms of an immediate attack, we must only remain still in échelons, watching the movements of the enemy.

If he still continues his circular movement towards our left, we must reverse the échelon.

If he shows a disposition to attack immediately, we must wheel into line.

If he continues the movement, we must wheel the squadrons again 'half left.'

The enemy will have now reached the left of our original position. If he attack from this quarter, we have only to form line by the direct movement, the time for which formation has been already given, and meet his attack, or else to charge in échelons if this time is not available.

The above gives the application of the direct échelon movements in their most elementary form, divested of all accessories. The movements for protecting flanks, for masking or protecting the movements of one portion of the force by the combined movements of another, the movements of artillery, of second lines, &c., belong more properly to the combination of these movements, when applied to brigade movements on a large scale.

But enough has already been stated, to show that the employment of the single échelon movement given would be sufficient to meet all the movements which it is reasonable to suppose the enemy might make.

The case just supposed is much less likely to occur than formerly. The powerful fire of the artillery at long ranges will most probably put an end to much preliminary arrangement in the way of movements and counter-movements preceding the attack. We should not find it advantageous, unless under some peculiar circumstances, to occupy the same locality, merely making counter-movements, intended to parry the movements of the enemy; and if we did adopt such a mode of proceeding, we should be powerfully protected by our own artillery, or by some particular formation of the ground.

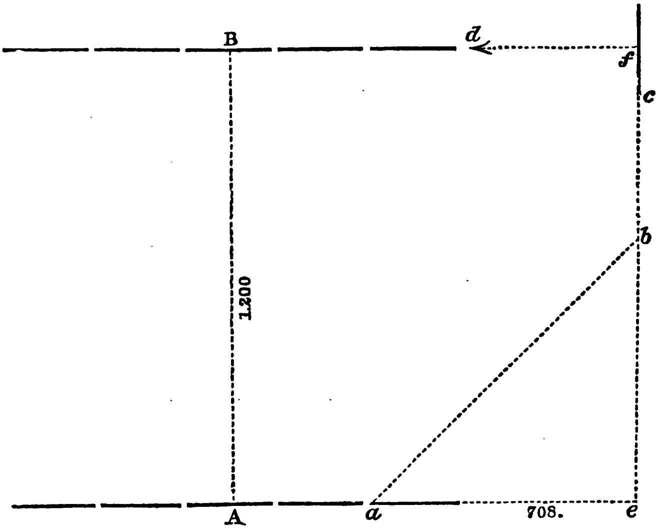
It would be much more congenial to the tactics of the present day, that we should cut short the enemy's preliminary movements by a rapid and determined attack, making the changes on the move during the advance, if such changes were required, and, while he was preparing to attack us on one flank, attacking him on the other.

Let us now examine how the proposed movement may be employed in making a flank attack

When employed to make a flank attack.

An attack of this kind is generally combined with a front attack, or is favoured by particular circumstances; but at present we will treat it separately and apart, and merely with reference to the application of the movements necessary to place the attacking force in the required position, perpendicular to the prolongation of the alignment, and opposite the flank of the enemy.

Fig. 45.



Let it be supposed, for the sake of example, that B, the position of the enemy, is at a distance of about 1200 yards from our own position A; and for the present we shall consider the enemy's flank as a stationary point.

It will be shown, when we come to speak of the action of the cavalry combined with the artillery, that in order to make an attack, effectively supported by the artillery, it is desirable that the attacking force should commence the movement of attack at a distance of about 480 yards from the point of attack.

The first thing to be done, therefore, is to gain about this distance to the flank, so as to get a good offing, and to effect this object during the advance, as rapidly and imperceptibly as we can, leaving as little time for a counter-movement as possible.

Taking a regiment of 4 squadrons of 48 files as the attacking force, and supposing the movement of attack to be made from the right of our line against the enemy's left flank, the first movement will be along the line *a b*, at an angle of 45° with the prolongation of our own alignment.

The extent of front of the flank regiment, which is to attack, is 228 yards, which added to 480 yards, the distance to be gained to the flank, equals 708 yards. In gaining this distance to the flank by the oblique movement, we shall have also gained an equal distance *e b* on the line perpendicular to our own alignment produced.*

The next movement will be from *b* to *c*, a point distant 114 yards (half the extent of front of the regiment), from the point *f* in the prolongation of the alignment of the enemy's position.

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* Because the tangent of 45° = the radius.

The regiment must then be placed perpendicular to the line of attack *f d*. Let it be supposed that the flank regiment has been formed in échelons of squadrons at half distance, left in front, the leading squadron being at the point *a*.

The squadrons are first wheeled to the right 45°; this changes the leading of the échelons, and the formation becomes an échelon of squadrons at half distance, right in front; the general front of the échelon being perpendicular to the diagonal line of movement *a b*.

The gallop is then sounded, and the échelon moves forward, *a b* representing the line of movement of the left squadron. The movement in direct échelons at half distance having been previously well practised at all paces, the distance *a b* should be described at a gallop, with perfect steadiness.

Upon approaching the point *b* the trot will be sounded; then the signal 'Left,' followed by the signal to wheel, upon which all the squadrons wheel to the left an angle of 45°. This again changes the leading of the échelon, and it becomes as before an échelon of squadrons at half distance, left in front; the general front of the échelons being perpendicular to the line of movement *b c*.

The signal is then given for reversing the échelons, which is done on the move; the rear squadron, and all the others in succession, taking up the gallop. During the passage from *b* to *c* the échelon becomes reversed, consequently upon the left squadron arriving at the point *c*, the regiment is in échelon at half distance, right in front.

Upon approaching the point *c*, the signal 'Left' is given; and upon the rear échelon arriving at *c*, the signal to wheel, upon which all the squadrons wheel 45° to the left.

The signal is then given to reverse the échelons, which is done at the gallop.

During the reversion, the signal 'Left' is again given, and upon the movement being completed the signal is given to wheel.

The squadrons then wheel an angle of 45°, which places the general front of the échelons perpendicular to the line of attack *f d*, at a distance from the flank of the enemy's position of about 480 yards.

The cavalry may then charge in échelons, supported by the artillery, as hereafter explained, or form line and charge, according to circumstances.

The distance *a b* will be found equal to 991 yards; * this at the gallop will be performed in 165 seconds, or 2 minutes 45 seconds. The distance *b c* will equal 378 yards, which at the trot will be performed in 94 seconds, or 1 minute 34 seconds. The échelon is reversed, while passing this distance of 378 yards; a reference to the Appendix will show that when the combined paces, by which the movement is effected, are, as in the present instance, the trot and the gallop, the distance in which the reversion is completed on the move is 288 yards; it will therefore be completed within the 378 yards. The three wheels of the squadrons necessary during the advance would occupy 21 seconds, and the time taken in reversing the échelons at the point *c*, after the wheel, would be 24 seconds.

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* *a b* is the secant of 45° to radius 708 yards.

These times added together equal 5 minutes 4 seconds; therefore in five minutes from the commencement of the movement, at a distance of 1200 yards from the enemy's position, the attacking force will be placed with its artillery ready to act, the centre of its line being opposite to and at a distance of 480 yards from the enemy's flank, and its general front or alignment perpendicular to the line of attack.

It will be shown that this distance of 480 yards admits of an effective and powerful support from the artillery during the subsequent attack. Up to the point *c* the artillery will have done no more than accompany and keep up with the cavalry in the advance; at this point their action will commence.

If we cannot move steadily in direct échelons of squadrons at half distance at the trot and the gallop, the advance to the attack will of course be disorderly, and we shall have to pause at the point *c* to get ourselves together before we attack. But if we cannot move steadily in short échelons, it must be inferred that we cannot move steadily in line, for the former is rather the easier movement of the two; and if we cannot depend upon our troops moving with tolerable steadiness, as well as with speed, we had better relinquish the idea of making a flank attack.

It will be observed that the trot is taken up at the point *b*, as we approach the enemy's position, and the walk by the directing squadron at the point *c*, to allow the artillery to take up a position and come into action. This will give an opportunity to the troops to collect themselves to a certain extent previous to the attack; it will also give breathing time to the horses. The artillery horses get breathing time while the guns are in action.

In case of threatened attack during our movement.

Although five minutes seems a short time, still in cavalry movements circumstances change rapidly, and we may meet with unforeseen obstacles and difficulties; therefore the arrangements for advancing to the attack must be so constituted that, during our approaches, the whole attacking force shall be held well in hand however rapid the pace, so as to meet any sudden or unforeseen change even during the moments of action.

We shall now see how far the present system meets these requirements, and is adapted for all circumstances which may present themselves.

We will consider in the first place the movement along the line *a b*, upon the supposition that the place in line of the attacking body is filled up from the second line, or otherwise, and that the flank attack is supported and seconded by a direct attack, or at least by an advance of the whole line in échelons from the left, or is otherwise supported by artillery &c. Any attempt to attack from the enemy's position the flank of the échelons moving in the diagonal line *a b* might be frustrated by a portion of our main body, which would be in a position to take in flank any force attempting such an attack, particularly as our flank attacking party would be as close to our own force as to the enemy, while moving on the diagonal line.

But if the preparations for the attack in flank by the enemy should appear serious, and likely to be made in force, and should consequently require the development of a large body to repel it, and a temporary relinquishment of our own flank attack, it would be only necessary to wheel the squadrons 45° to the left; this movement for the whole attacking force, whatever might be its strength, would only occupy about six seconds. Then, if the attack is made from any point between *d* and *f*, we are in a position to charge in échelons, or to form line and charge, as circumstances may require.

If the attack should come in a direction perpendicular to the oblique line of movement *a b*, or nearly so, it would be only necessary to reverse as many squadrons as may be required, with reference to the force of the enemy employed; to wheel the squadrons 45° to the left, and meet the attack by charging in échelons or line, as the case may require. The artillery also could come into action and support; but on account of the position and movement of the main body, and for the reasons already stated, it is unlikely that the flank attack would be disturbed at this early stage of the proceedings.

We next come to the movement along the perpendicular line *b c*.

While the échelon is in movement along this line, if a flank attack from the enemy's position should be threatened, before the reversion of the échelons is completed, it would only be necessary to sound the walk, or the halt, as the occasion may demand, and immediately after the signal to reverse at the gallop. By this means the reversion can be completed at any intermediate point between *b* and *c* in twenty-four seconds; and, as soon as the échelons are reversed, a wheel of the squadrons of 45° will place them in a position to meet the attack either by a charge in échelons or a formation in line.

The movement on the line *b c* is also protected by the gradual advance of the main body to the direct attack, which advance would most likely have the effect of paralysing any attempts of the enemy against our flank attack.

Any attack of this kind upon a small scale might be met by the officer in command giving the order to one, two, or three squadrons, as he may think advisable, to walk or halt; and then reversing the échelon, which would be done by the squadrons first halting or dropping into the walk, and then successively taking up the pace at which the rest of the échelon was moving, as each squadron gains the correct distance. These squadrons will then be in a position to wheel to the left 45°, and repel an attack if necessary.

Two squadrons could be thus reversed in eight seconds, three in sixteen seconds, and so on.

Advantages of the system proposed.

It will be observed that, throughout this flank movement, the échelons remain well in hand. A formation could be effected, and an attack from the direction of the enemy repelled, at any moment during the advance.

The distance which the échelon advances on each line of movement may also be regulated according to circumstances, as well as the pace, which may be increased or diminished as required.

The change of direction can be made at any point, or at any moment, at the discretion of the officer commanding.

The place in line of the attacking regiment or regiments can be filled from the second line or otherwise; and a front attack, either in échelon or line, can be made in combination with the attack in flank. This, together with the rapidity and suddenness of the movement, may paralyse the movements of the enemy; and we may find him more or less unprepared for the flank attack, especially if it is covered by clouds of skirmishers, and the fire of the artillery attached to the advancing line. The artillery with the flank attack can do no more than keep up with the cavalry in the advance, and must reserve their fire for close range, to support the charge.

The advantages attending a flank attack, particularly in attacking cavalry, are so well and generally known that it is unnecessary to enter into detail on the subject. In addition to the moral effect upon men and horses in a body attacked in flank, especially when an attack in front is threatened at the same time, causing confusion, unsteadiness, and excitement, the flank attack of cavalry, if successful, is particularly disastrous; for it drives the defeated body back on their own line, leaving them no time to rally, and causing most probably irremediable confusion and disorder.

We should advance, and gain our point of vantage on the flank, as rapidly as we can without producing disorder, leaving the enemy as short a time for preparation as possible. But having once gained this point, we might take a few seconds' breathing time, during which the leading échelon walks, the remainder form in line with it, the artillery get into action, and all our forces are being collected for the final rush. If the enemy's preparations are not matured before we reach this point, a second or two will not enable him to remedy the mischief; and it is most important that we should make our attack steadily and in good order, and have the full advantage of the fire of our artillery, if circumstances permit.

Power of repelling a flank attack.

In making this attack, however, if the enemy's flanks are protected, as they ought to be, we may be taken in flank ourselves. We will now examine how the movements proposed are adapted for a provision against this contingency.

The risk of such a flank attack would be incurred when the échelon was moving in the prolongation of the alignment of the enemy's line, and approaching the flank. The reverse flank of the échelon should be protected if possible in the usual way, by placing a small body in rear of the advanced échelon, with no other duty to perform than that of guarding the flank, and protecting the échelon against attack in that quarter. The flank is so weak a point in cavalry, that this precaution should never be omitted in any movements near the enemy.

But if the flank attack should be serious and made in force, requiring consequently the development of a larger body to repel it, we have only to slacken the speed of the leading échelon for a few strides, by word of command from the commanding officer, as before explained, so that the first squadron shall drop into direct échelon at half distance, in rear of the second squadron of the échelon; or, if this is not sufficient, the first and second squadrons may form in échelon in the same way in rear of the third. This change, being nothing more than reversing a portion of the échelon, is effected, as already stated, in eight seconds for two squadrons, sixteen seconds for three squadrons, &c. We are then in position to form in any direction, so as to repel an attack upon the reverse flank.

The present case has been taken, merely to exemplify what might be effected by employing the single movement from line proposed, under one particular combination of circumstances. In practice we may find the circumstances altogether different; the distance between the two forces may be different: the attacking force either greater or smaller than the one supposed: the enemy may threaten an attack during the advance: or, during the few minutes occupied in advancing to the attack, he may have altered the disposition of his flank, so as to advance his cavalry to meet us on the line of attack.

It has been shown that the advance to the point of attack is so rapid that there is little time for preparation on the part of the enemy; and it will be observed, that from the nature of the movement, our intention may not be at once perceived, and, during the indecision upon this point, some seconds of the time which might be employed by the enemy in preparation would be lost. It would then be necessary to convey orders, and put them in execution; and if, added to this, the enemy's attention is diverted from the flank, by a front attack in force being threatened and supported by artillery, the probability is that we shall find him unprepared, or in the act of preparation.

If the distance between the two forces should be less than that supposed, the échelons might be reversed and wheeled at the point *b*, or at any intermediate point between *a* and *b*. Although, in order to give an attacking force the full support of artillery, it may be desirable to commence the actual assault at a distance of about 480 yards from the point of attack, still it will be shown that an attack supported by artillery may be made at a much shorter distance; therefore, if the distance should be shortened to correspond with the distance between the two positions, it will not be necessary to gain so much to a flank, and as a consequence, it will not be necessary to proceed so far on the diagonal line.

If a flank attack is made in force, there ought to be sufficient room to manœuvre the attacking body, and consequently a certain distance between the two positions.

If the distance between the two forces is very much restricted, the support of artillery might be altogether dispensed with, and a small body without artillery might be employed for the flank movement.

If the attacking force is greater than the one supposed, in order to gain 480 yards to the flank, it will evidently be necessary to increase the distance *a e*, and consequently the distance *e b* will also become increased. Therefore, if the distance between the two positions is not greater than that supposed, we must reduce the progressive motion of the whole body, and reverse the échelons, as already described, before reaching the point *c*. But as the progressive motion is completely in the hands of the conductor, to increase or diminish at pleasure, this will not be attended with any difficulty whatever.

It would be impossible to suppose all the various combinations of circumstances which might occur in practice, but it is hoped that enough has been said, to show that the proposed system would work under all circumstances.

We cannot attempt to provide for all contingencies beforehand; all that can be done is to get the machinery in good working order, to make all the details as simple and the combinations as perfect as possible, and then to place the direction of the whole in the hands of one who knows his work well, who understands thoroughly all the details of the mechanism he has to guide and control in order to effect his object, who is prompt to decide, quick to apprehend, and resolute in action, who has a tolerably cool head and clear judgment, and is not carried away by excitement.

If the ground is not sufficiently open to employ the échelon formations just described, we must have recourse to the column movement either in whole or part; but in this case it will most likely be possible to move under cover to a point within reach of the enemy's flank. The column movements, and the line formations from column proposed, will be found well-adapted for a rapid movement in columns of route through defiles or broken ground, and a subsequent formation in line or échelon preparatory to an attack.

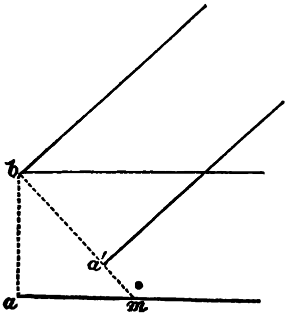
Movements of the rear rank.

So far the movements of only one rank have been spoken of. The line movements of the second or rear rank are of so simple a nature that they hardly require explanation.

If the first line or front rank continues in movement after the change of 45°, it will be only necessary that the rear rank or second line should change direction by the same process as that employed by the first line, commencing the movement at the same point. In retiring, the same rule holds good; the first line changing at the same point as the second line.

If the first line halts after the change is completed either by throwing a flank forward or back, it will be necessary for the rear rank or second line to make, in the first instance, a flank movement; thus, a marker measures from the flank of the second line *a*, the distance *a m*, equal to *a b*, the distance between ranks at the time, and posts himself at *m*. (Figs. 46 and 47.)

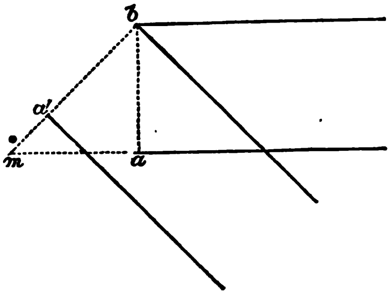
Fig. 46.



In the meantime, the second line will have wheeled to the flank into column of threes or divisions, and, as soon as the marker is posted, it takes ground to the flank in column at the trot or gallop.

When the flank *a* arrives at *m*, the line is halted and wheeled into line. The change will then be effected by means of the direct échelon movement, exactly as in the first line. When the change is completed, the line moves up the distance *m a'*, which places the second line in the same relative position to the first as that occupied before the change.

Fig. 47.



The distance *m a'* will always equal two-fifths of the distance *a b* between the ranks.

The distance between ranks can be reduced or increased according to circumstances.

There may also be conditions, which may render it desirable that the second line should slightly outflank the front line or rank, and that at the same time the distance between ranks should be reduced, in which case the flank movement would be unnecessary.

Retiring by alternate squadrons.

The change of direction while retiring by alternate squadrons, the passage of lines, &c., can be effected by a slight modification of the échelon formation just described.

The first movement is attended with some difficulties, and this has led to its being struck out of the French system, but we have retained it. By a little management and care the difficulties may be obviated, and the movement is by far too valuable and useful to be dispensed with.

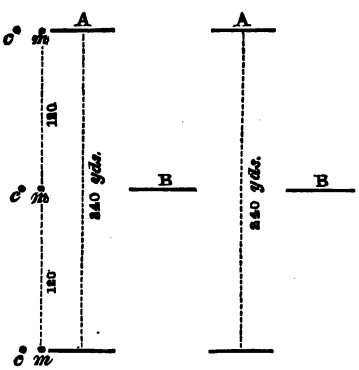
As the principal difficulty of the movement is involved in the guidance and leading of the squadrons, it is proposed that a squadron of direction should be named, and a base given in each line during the retreat: also that the regimental marker, with two or three assistants, should be employed under officers appointed to superintend, to give the alignments for the successive formations of the retiring lines.

The distance alternately described by the lines in retiring should be 240 yards, instead of the 200 yards laid down in our regulations; in which case there would be 120 yards instead of 100 yards between lines.

The reason for this slight change will be given when we come to the artillery movement in support.

The alignments for the retiring lines would therefore be given by two covering points, *c*, *m*, at successive distances of 120 yards.

Fig. 48.



The squadron marker should not cover the flank-file of the adjacent squadron, when moving in direct échelons, because the adoption of such a plan would be a departure from the general central regulating principle, which is supposed to pervade all the arrangements for leading when in movement.

But in the present instance the case is altered. The flanks of the adjacent squadrons in the halted line are stationary points, and, the squadron being halted, it is to be supposed that the intervals between files are correct.

It is therefore proposed that, upon each line going about, the squadron marker should take up the covering of the flank of the adjacent squadron in the standing line, towards the directing hand. The squadron serrefile judges his interval from the marker, until the halted line is passed, when the retiring line takes up the walk, and the markers gallop forward 120 yards, go about, and take up again the covering of the same flanks, in the alignment given by the regimental marker and his assistants. This will serve as a guide to the serrefiles of the retiring squadrons.

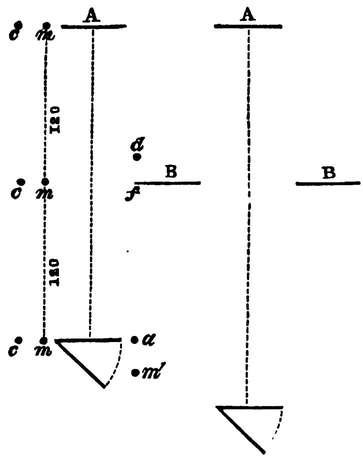
Each line trots till the halted line is reached, and then takes up the walk. The advanced line goes about, as soon as the retired line is halted and fronted.

Change of direction while thus retiring.

For reasons already stated, it is considered that a change of 45° at any one time would be sufficient to meet all contingencies. In order to effect this change, which can of course be repeated as often as required, it will, in the first place, be necessary to mark the points where each line is to effect the change of direction in succession.

For the line A A, containing the flank squadron towards the inner hand, the marker and coverer *m c*, posted to give the alignment at 240 yards to the rear, will indicate the point where this line is to effect the change of direction.

Fig. 49.



The point where the other line B B should commence the change of direction may be marked thus:—

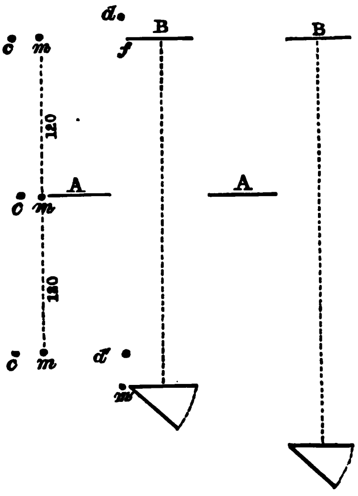
A marker posts himself at *a*, in the alignment *c m*, at a distance from *m* equal to the squadron front and interval, and covering just clear of the inner flank *f* of the inner flank squadron of the line B B. Another marker then posts himself at *m′*, covering in the line *f a*, and at half squadron distance *a m* from *a*; when the marker *m′* is posted, *a* retires, and the markers at *m* and *m′* will indicate the points where each line is to commence the change of direction.

If a sufficient number of markers is not available to give the point at *a*, the marker *m′* can in the first place post himself at *a* as described, and then go about, take half squadron distance *a m′* to the rear, front, and cover just clear of the flank *f*; a covering point might be given at *d* to assist in this.

The advanced line, having gone about as usual, and retired at the trot, will get the signal to form échelons.

The markers in this case take up the covering and distance as usual from the centre of the preceding squadron in the retiring échelon; but, in consequence of the absence of the alternate squadrons, the distance will be full squadron distance, instead of the usual half distance. If, in addition to this, an assistant marker could be spared from each squadron, to take up the covering of the flank of the adjacent halted squadron, in the alignment of the squadron marker and serrefile, it would be an

Fig. 50.



additional assistance to the squadron serrefile in leading to the rear.

Let a regiment of four squadrons of forty-eight files each be taken as usual as an example, and let it be supposed that the right flank is to be thrown back. (If the left flank is to be thrown back, of course the same arrangements will hold good, substituting left for right.)

The advanced line retires at the trot as usual:—

The flank squadron and each squadron in succession, as the correct distance is gained, takes up the gallop.

The échelon will be thus formed on the move, the combination of paces employed to effect it being the trot and gallop.

In the present instance each line will consist of two squadrons. A reference to the Appendix will show that, when the combined paces are the trot and gallop, two squadrons can be formed in direct échelons at full distance, on the move, in 96 yards, therefore the formation will be completed within the 240 yards.

During the retreat the signal 'Right' may be sounded, and when the inner flank has arrived at the wheeling point (marked as described), the signal to wheel will be given, upon which the squadrons wheel 45° to the right, and then form line with the leading échelon, upon the signal being given.

The next line goes about, upon the halting and fronting of the retired line as usual, and retires at the trot, échelons being formed on the move during the retreat, as before, by the flank squadron, the others in succession taking up the gallop. The two squadrons composing this line will also be formed in échelons on the move, as already shown. In passing over the 120 yards, during the retreat, the signal 'Right' will be sounded, and upon reaching the proper marker, posted as described, the signal to wheel will be given, when, the wheel being completed, the échelon moves forward in the new direction at the trot, passing through the intervals of the standing line, and continues the trot till the last squadron of the échelons has passed, when the walk may be taken up as usual.

The markers also gallop forward as usual upon passing the standing line, and take up their covering points in the alignment, at a distance from the standing line of 120 yards. Upon reaching this alignment the line will be formed upon the leading squadron of the échelons.

So far we have supposed the retiring body to consist of a regiment of four squadrons.

We shall now suppose it to consist of eight squadrons, each retiring line being composed of four squadrons; and it will be shown that a very slight modification of the arrangement just described will adapt it to this case also. The line retiring first describes a distance of 240 yards, before reaching the point where the change of direction should be made; and the next line only 120 + 24 yards: whereas a distance of 288 yards is required to throw the four squadrons into échelons on the move. Therefore, in this case, a slight modification of the arrangements will be required, as follows:—

About half a minute before the usual time of retiring, the signal will be given to retire in échelons from the right. The right squadron goes about by word from the squadron leader, and retires at the trot; the next squadron goes about and retires also at the trot, when the correct distance is gained, and so on, till the whole line is in échelons, when the movement proceeds as already described. The time for commencing the échelon formation will be just before the rear échelon of the advanced line passes through the intervals.

Passage of lines.

The formations in direct échelons of squadrons are useful for the passage of lines, used in relieving one line by another, and on other occasions.

The lines being formed in direct échelons of squadrons at half distance, the same flank leading in both lines, if the second line be moved up and halted, so as to place the échelons B B &c. opposite to the intervals between the échelons A A &c. of the first line, the squadrons composing the échelons of the first line can wheel by threes or divisions to a flank. Then, if each échelon takes ground to the flank at the gallop, halts, and fronts in rear of the corresponding échelon of the second line, the front of the second line échelons will be left clear, and line can be formed to the front at once by the direct movement. Only ten seconds will be occupied in clearing the front of the first line, whatever may be the number of squadrons.

The second line, if consisting of one regiment, can be formed in line in twelve seconds ; therefore, the second line would be ready to act in line in twenty-two seconds, less than half a minute; or, if time was of importance, the second line might attack in échelon, in which case, the movement of relieving the lines and leaving the second line free to act would be concluded in ten seconds.

By extending to full distance, the same movement may be executed on the move without halting. Taking the squadron at 48 files, the interval will equal 12 yards. While the échelons of the first line are passing over this interval at the gallop, the échelons of the second line, moving at the walk, will have described one-third of the distance or 4 yards, which will more than clear the rank, the depth of which is 8 feet, leaving room for the échelons of the first line to pass in rear.

While the échelons of the first line are passing over 60 yards, the squadron front and interval, the échelons of the second line, moving at the walk, will have only described 20 yards ; therefore, the front will be cleared in time for the advance of the échelons of the second line; but, being at full distance instead of half-distance, twice the time will be required to form line.

The movement by alternate squadrons retiring and advancing might also be applied to the same purpose ; and this movement, as well as échelons at full distance from the centre, if employed for a second line acting in support, leaves plenty of room for the passage of the first line to the rear in case of a reverse.

Lines might be relieved by the second line forming from column on the move, according to the system proposed, the first line gradually retiring by column of divisions from the same flank as that upon which the formation of the second line is being effected in rear of the opposite flank.

CHAPTER XIII.

ARTILLERY COMBINED WITH CAVALRY.

Faster pace required for artillery.

THE artillery, in order to fire, must halt and come into action. Therefore, when acting in support, during the advance or retreat of the cavalry, the artillery must move at a faster rate than the cavalry, and thus gain time to take up consecutive positions in advance, to come into action, and to deliver their fire before they become masked by the continued advance of the cavalry; or, to be in action and ready to open fire, as they become unmasked by the continued retreat of the cavalry.

Artillery must be divided into two or more portions.

It is necessary also to divide the artillery into two or more portions, in order to avoid a cessation of fire, and in order to protect the limbering up, or coming into action, of one portion, by the fire of the other.

Artillery acting with cavalry. In the advance or retreat in line.

We will, in the first place, suppose the artillery to be divided into two portions only; we will also consider the matter in its most simple form, and suppose a continued advance or retreat of a body of cavalry in line, supported or protected by two bodies of artillery, taking up consecutive positions in advance, and delivering a certain number of rounds; the limbering up, or the coming into action, of one body, being protected by the fire of the other.

If the cavalry move at the trot or gallop, the difference between such paces and the faster paces of the artillery would be comparatively so small, and consequently the distances between the consecutive positions, which it would be necessary to take up in order to gain time for the action of the artillery, would be so great, that the combined action of the two arms in a continuous movement would be impracticable; although, for the actual attack, when a continuation of the movement is not contemplated, these paces may be employed in combination with the action of the artillery, as hereafter described. But, under the supposition that the movement is to be continued, the velocity of the cavalry from the moment the artillery commences to act, must not exceed the walk. The artillery, however, can always accompany the cavalry, while moving at the trot or gallop, to the point of action, and be thus ready to act in concert at the proper moment.

It is proposed that the combined paces of the two arms, for all ordinary and continuous movements, should be the walk, and the gallop-out of the artillery; the first rate being two yards, and the last eight yards in a second; the latter pace being four times as fast as the former.*

If we suppose the continuous advance of a body of cavalry along the line $x\ y$, and that, during such advance, one body of artillery takes up the consecutive positions *m m′*, and the other the positions *n n′*, &c. (Fig. 51):—

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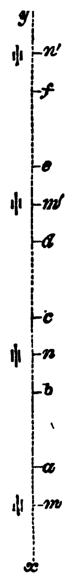
* The exponent of the ratio of the two velocities (represented by a) will in this case be 4.

Fig. 51.



Then, when the cavalry in its advance passes the point *m*, the artillery posted at that point becomes masked, ceases firing, limbers up and gallops forward to the next position *m′*.

During the limbering up of the artillery, the cavalry, continuing the advance, will have described a certain distance *m a*; therefore, at the moment when the artillery starts for the new position at *m′*, the cavalry will be at the point *a*.

During the movement of the artillery from *m* to *m′*, the cavalry, still continuing the advance, will have described a distance *a b*, equal to one-fourth of *m m′*; during all this time the artillery at *n* will have been in action.

While the cavalry describes the distance *b n*, the artillery at *m′* will come into action under the protection of the artillery at *n*. When the latter becomes masked in turn, by the advance of the cavalry, the artillery at *m′* will be in action, and will be ready to open fire; there will, therefore, be no cessation of fire.

When the artillery at *n* has limbered up, the cavalry will have reached *c*, and when the artillery has arrived at the point *n′*, the cavalry will have reached *d*, *c d* being one-fourth of *n*, *n′*.

While the cavalry describes the distance *d m′*, the artillery comes into action at *n′*, under the protection of the artillery at *m′*; and so on, as long as the advance of the cavalry may be continued.

If we suppose a continuous movement of the cavalry in retreat along the line *y x*: when the cavalry retiring arrives at the point *n′*, the artillery at that point, the front becoming clear, can open fire; and when the cavalry arrives at *m′*, the artillery at that point also, becoming unmasked, can open fire, and protect the limbering up of the artillery at *n′*.

At the moment when the artillery at *n′*, having limbered up under the protection of the artillery at *m′*, starts for the new position at *n*, the cavalry will have described a certain distance *m′ d*.

During the time that the artillery, moving with the velocity of eight yards in a second, describes the distance *n′ n*, the cavalry, moving with the velocity of two yards in a second, will have described *d c*, one-fourth of such distance.

During the time that the cavalry describes the distance *c n*, the artillery arrived at *n* will have come into action, and will be ready to open fire at the moment that the cavalry passes the point *n*; there will therefore be no cessation of fire.

While the cavalry describes the distance *n b*, the artillery at *m′* will have limbered up, under the protection of the artillery at *n*.

While the artillery describes the distance *m′ m*, the cavalry will have described *b a*, one-fourth of such distance.

While the cavalry describes the distance *a m*, the artillery at *m* will have come into action, and will be ready to open fire, at the moment that the cavalry in retiring clears the point *m*; and so on, as long as the retreat of the cavalry may be continued.

According to the proposed arrangement, the velocity of the artillery is four times the velocity of the cavalry; therefore, if we make *a b* equal to *m a* added to *b n*, (*m a* and *b n* representing the distances described by the cavalry, while the artillery is limbering up, or coming into action); *c d*, equal to *n c*, added to *d m′*; *e f* equal to *m e*, added to *f n′*, &c.; then *m m′* will be equal to four times *a b*, *n n′* to four times *c d*, and so on. Therefore, so long as the movement of advance or retreat may be continued, the two bodies, moving respectively with the velocities proposed, will arrive opposite the different points along the line of movement at the times required.

It only remains, therefore, to determine the distances *m a*, *b n*, *n c*, *d m′*, *m e*, *f n′*, &c. These distances will evidently be dependent upon the time occupied in limbering up and coming into action.

In some services these movements may be performed more quickly than in others, but there can be no difficulty in ascertaining the time required with sufficient exactness for practical purposes.

Ample time, and even a certain margin, should be allowed, so that there shall be no hurry in the movement. At the same time, it is evident that the more rapidly these movements can be performed, the closer can the positions of the artillery be approached to each other.

For the sake of example, let one minute be allotted for the two movements, of limbering up, and coming into action; thirty seconds for each.

During one minute (sixty seconds), the cavalry, moving with the velocity of two yards in a second, will describe 120 yards. Consequently, upon this supposition, the distances, *a b*, *c d*, *e f*, &c., will each equal 120 yards.

These distances being determined, determine the distances, *m m′*, *n n′*, &c., between the consecutive positions of the artillery; these distances being 4 120, or 480 yards; giving the distances, *m n*, *n m′*, *m′ n′*, &c., between the contiguous positions of the two portions into which the artillery is divided, each equal to 240 yards.

It is evident that the artillery in each position will remain in action during the time occupied by the cavalry in describing these distances, *m n*, *n m′*, *m′ n′*, &c. Therefore, the number of rounds which can be fired in each position will depend upon the rapidity with which the artillery can deliver their fire.

This may also vary in different services; but ample time and a certain margin should be allowed in this movement also, in order to avoid hurried firing, which is generally ineffective.

We shall, for the sake of example, allow 30 seconds for each round of shrapnel or round shot. The distance of 240 yards will be described by the cavalry in

120 seconds, giving time, upon the suppositions made, for four rounds of shrapnel or round shot in each position of the artillery.

The artillery have to move at the rate of eight yards in a second, about 16 miles an hour, but this is only for a distance of 480 yards. Between each movement the horses get three minutes' rest and breathing-time, while the artillery are coming into action, delivering their fire, and limbering up.

The first points to be gained are correctness of pace in the two moving bodies which are to act in concert, and correct measurement of distance, or at least a sufficient approximation to correctness for all practical purposes. There is no insuperable difficulty in this matter; a very little practice, and a little intelligence on the part of markers and leaders, will effect success. A distance of 480 yards being marked out, the artillery markers can easily ascertain the number of strides taken by their horses in passing over this distance in one minute. Or, if this distance is not conveniently available, one-half or one-fourth may be measured off, the number of strides being multiplied by two or four accordingly. This rate also, will become habitual to horses and men by a little practice, and will be sufficient for taking up points, as there will be ample time for doing so while the artillery are in action and limbering up. At the rate of 16 miles per hour, a horse will take 25 strides in every 100 yards, or in the proportion of 1 to 4; this would give 120 strides in 480 yards.

I know by practical experience, that pace can be brought to great exactness; but all we require is a tolerably close approximation to exactness within reasonable limits. However uncertain or irregular the pace may be, there must be some limits within which we can work the two arms in concert; even if we cannot hit it off within 30 seconds, which is a very wide margin, at each successive movement, it will only be one round more or less in each position of the artillery; and even this will be far preferable to having no arrangement at all, the artillery either galloping too fast and too far, thus blowing their horses, and losing the support of the cavalry, or else taking too short a distance, and thus becoming masked, before a sufficient number of rounds have been delivered.

With a little practice the pace can be brought to great exactness. It will be only the same thing over and over again, whether in the advance or in the retreat.

The marker of the artillery gallops forward the 480 yards, and takes up the position to be occupied by the portion of the artillery to which he is attached. The artillery, having delivered their four rounds, and becoming masked by the cavalry in the advance, or, in the retreat, upon the artillery in the next position opening fire, limber up, and move, at the rate of 8 yards in a second, to the new position taken up by the marker; and this may be repeated as long as the cavalry continues the advance or retreat.

Each portion into which the artillery is divided, having done so much with tolerable exactness as to time and pace, will have acted its part in the performance. There will be no necessity for orders or explanations, beyond the general direction to support the advance or retreat of the cavalry, when the commandant may calculate upon all going on as described, until the attack takes place, or until he issues further orders; or it may be left to the discretion of the officer commanding the artillery to support the movement of the cavalry, when within range, without waiting for any orders.

Orders are so often misunderstood or incorrectly conveyed, in the hurry and confusion of action, that it is highly important that all combined movements should be perfectly simple, and divested of all complication. Each movement should be so much a matter of course (the same thing being always to be done under the same circumstances), that there shall be no room for misconception, and no necessity for explanations.

The matter has here been treated only in its simplest form, a continuous advance or retreat of the cavalry upon a direct line of movement having alone been supposed.

In the formation from column.

But it is evident that the action of the artillery, in protecting the formations from column on the move, made according to the system proposed, when the base of the formation moves at the walk, involves only the same principles of movement as the simple and continued advance just supposed; for the movement of the leading rank or base of formation, in connection with which the artillery should act, is nothing more than a simple and continuous advance at the walk, the formation of the rest of the column being effected on this moving base, by means of the trot or the gallop. Consequently, the movements of the artillery, in protecting a formation from column on the move, will be exactly the same as those just described in the advance.

In retiring by alternate squadrons.

In retiring by alternate squadrons, the advanced line retires 120 yards at the trot, and then, upon reaching the standing line, takes up the walk, and describes 120 yards at the latter pace.

The other line then describes 120 yards at the trot.

We have therefore 240 yards at the trot, and 120 yards at the walk; but as the trot is just twice as fast as the walk, this, in point of time, amounts to exactly the same as the continuous movement of a single body over 240 yards at the walk. As the same will hold good with reference to the retreat of each line in succession, in this case also, the action of the artillery, in protecting the movement by alternate squadrons, will be exactly the same as that just described in the retreat.

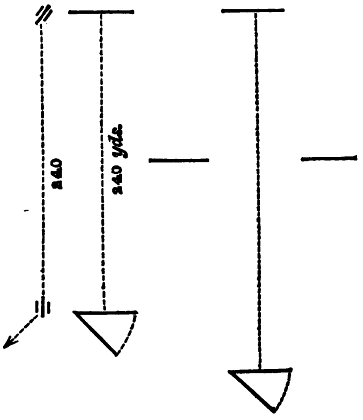
In the change of direction while thus retiring.

The change of direction, while retiring by alternate squadrons, as far as regards the corresponding movements of the artillery, will be attended with no difficulty.

The halting points of each line, at successive distances of 240 yards, will be marked on the line of movement during the retreat, and these points will also mark the adjacent positions of the two portions into which the artillery is divided, and may be taken up by the artillery markers.

The artillery should be attached to the line containing the flank squadron to the inner hand; this squadron will be near to support and defend the artillery, and as the point for changing direction will be on the flank of this squadron, the movements of the artillery during the change will be rendered more easy than they would be if the artillery were attached to the other line.

Fig. 52.

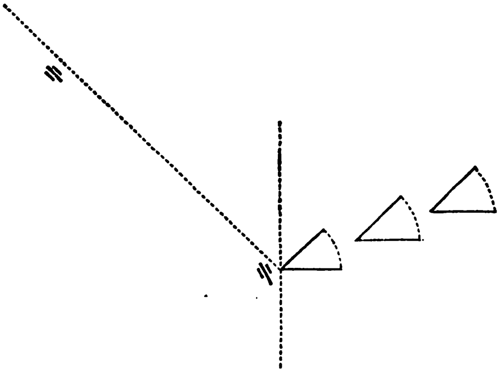


The artillery will only have to take up a position at the usual distance, on the new line of movement instead of the old, and when the change is completed, and the front clear, they will open fire in a new direction.

The movements of the artillery in the change of direction during the advance of the line will be equally simple, one of the positions of the artillery being selected if possible for the point of change. The next position will be taken on the new line of direction instead of on the old, all the arrangements, with this exception, being exactly the same as if no change had taken place.

If it should be necessary to change at an intermediate

Fig. 53.



point, notice should, if possible, be given in time to the artillery, to enable them to take up the position in advance on the new line of movement. The placing of the marker at the wheeling point for the cavalry will be sufficient indication, if no other intimation of the intention to change should be given.

If the cavalry should halt after the completion of the change, instead of continuing the movement, it would only be necessary for the artillery to remain in action on the inner flank, merely changing the direction of their fire.

Supports for the artillery.

The artillery should always have a sufficiently strong escort attached to defend them, and to secure them against any sudden attack by small bodies of the enemy. The distance between the artillery and the main body of the cavalry, gradually diminishing in the advance, and increasing in the retreat, will never exceed 240 yards. This distance can be passed over, even at the ordinary gallop of manœuvre, in little more than half a minute, and at a charging pace in less time if required. Therefore, in about half a minute, or, upon an emergency, in less time, the cavalry would reach the position of the artillery.

So long as the artillery is properly escorted, and occupies positions which are considerably nearer to our own force than to the enemy, there can be no danger, as we can move as fast to the support as the enemy can to the attack, and we have less ground to go over.

At the commencement of the movement of advance or retreat, upon the supposition that the artillery is upon the same alignment with the cavalry, and that the artillery is limbered up, it will be unnecessary in the first instance to make the usual allowance of 60 yards for the limbering up of the artillery; consequently, both portions of the artillery start together, one portion describing a distance of 420 yards (480 less 60), and the other 180 yards (240 less 60).

There will then be the usual distance of 240 yards between the adjacent positions of the two portions of the artillery, and the movement will then proceed as already described, as long as the advance or retreat continues.

While the portion of the artillery performing the shortest distance describes 180 yards, the cavalry, moving at the walk, will describe one-fourth of this distance, 45 yards; and while the artillery are coming into action, the cavalry will have advanced another 60 yards, making in all 105 yards. Therefore, when the artillery are in action, the cavalry will have reached a point distant from the position of the artillery 75 yards. This distance will be passed, at the walk, in 37 seconds, leaving only time for one round to support the coming into action of the artillery in the advanced position.

In retiring, one portion of the artillery halts and comes into action, while the other moves forward 180 yards; but as the first portion has to come into action during the retreat of the cavalry between the two positions, there will only be time for three rounds instead of four from the artillery occupying the first position.

Time required by artillery to act from column of route.

The time, within which the artillery will be available to support a formation from column of route, will of course depend upon the position which the artillery holds in the column. For well-known reasons, we must not place the artillery in front, or too near the head of the column; and, on the other hand, if the artillery are too far behind, we shall not have them up in time to support the first formations or an immediate attack.

The moment at which the artillery may be considered available for action, is when the last subdivision of the artillery has arrived in alignment with the moving base of formation.

The distance of this subdivision from the leading rank of the column, or base of formation, will evidently be the depth of the artillery column, minus such subdivision, added to the depth of the column of cavalry in front of the artillery.

It has been already shown, that when marching by threes in column of route, the depth of the column may be taken, in round numbers, at once and a quarter ($\frac{5}{4}$) the extent of front in line.

For example, let it be supposed that one battery of horse artillery is in rear of the front rank column of the first regiment. Taking the regimental 4 squadrons of 48 files each, the front will equal 228 yards, and consequently the depth of the column will equal 285 yards. The depth of a battery of artillery in column of subdivisions will be 118 yards; this includes the rear subdivision, about 19 yards; but this may be allowed for the distance between the last rank of the cavalry column and the head of the artillery column. The sum (403 yards) will therefore equal the distance of the last subdivision from the leading rank of the cavalry column, at the moment that the formation is commenced.

Upon the supposition that the formation is made at the gallop, while the leading rank or base of formation advances at the walk, the distance passed over by the rear subdivision, while overtaking the base of formation, moving at the walk, would be 604 yards.*

The rate of gallop is 6 yards in the second, and the artillery cannot exceed this rate till the column is cleared, which will occupy 100 seconds. Therefore the artillery would be in alignment with the base of formation, and ready to act, in 1 minute 40 seconds, a little over one minute and half.

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* The formation being made at the gallop, while the leading rank

As has been already shown, the next movement of the artillery would be 108 yards, at the rate of 8 yards in the second, which will occupy 13½ seconds. We may add one minute for coming into action and firing the first round.

Therefore, in less than three minutes from the moment that the order or signal was given to form, the first round would be fired in support, and both cavalry and artillery, without further order or explanation, would be in a position to continue the advance, affording a mutual support so long as it might be considered advisable to do so.

If the remaining portions of the artillery occupy different positions in the column, it will be easy to calculate the time in which their services will be available to the front.

It is not for a moment meant that this calculation is to be made in the field, although it is of so simple a nature that it might be made with ease in half a minute; but simply, that with reference to the average strength

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or base of formation advances at the walk, a, the exponent of the ratio of the two velocities, $= 3 \therefore a - 1 = 2$.

$$\text{Hence } \frac{403}{a-1} \times a = 604{\cdot}5,$$

$$\text{and } \frac{604{\cdot}5}{6} = 100{\cdot}75.$$

of regiments, the approximate time in which the action of the artillery to the front might be calculated upon should be known.

For instance, under all ordinary circumstances, if a battery of artillery occupied a position in the column of route in rear of the front rank column of the first regiment, the officer in command might calculate upon the first round being fired within three minutes of the head of the column issuing from a road or defile.

If the artillery is in rear of the rear rank column, about 1 minute 11 seconds should be added to the time given above, and so on for each column.

The collision with the enemy.

As regards the attack, it is evidently in our own power to regulate to a great extent the point of collision, by regulating and varying the rate of advance, &c. In practice, when we have bodies of cavalry to deal with, we can only attain a very rough approximation to exactness in the exercise of this power; still we can calculate upon attaining an approximation to exactness within certain limits; and although, when advancing to the attack, we cannot control the movements of the enemy, still it is to be supposed that we can regulate our own, and also that we can move as fast or as slow as he does. Under these suppositions, and within certain limits, we can always insure the collision taking place beyond a certain given point, and consequently up to this point the action of the artillery may be safely employed.

It is evident also, that in attacking infantry, when the point of attack may be considered stationary, the line of action of the artillery becomes considerably extended.

In attacking cavalry we are not bound to adopt the velocity employed by the enemy in his advance; we may see that, by adopting a more moderate rate at the commencement of the movement, we may allow the enemy to expend his force, and reduce his power of acting with vigour and effect, while we reserve our own powers and energies to be employed at the critical moment.

By our acting thus, the point of collision will be brought nearer to the starting point of our own force, and possibly one or more rounds from our artillery sacrificed in consequence; but it will be for the conductor of the movement to decide upon the most advantageous course to follow under all circumstances, avoiding the adoption of any course which might tend to compromise his artillery.

In all works upon cavalry tactics we generally find the following, or something to the same effect—'The commander of the cavalry should come promptly to a decision as to the mode of attack, and having once come to a decision upon this point, there should be no hesitation and no attempt to alter the course first adopted, but the torrent should be allowed to flow on uninterrupted,' &c.

Nothing can be more true than this, when we once arrive within charging distance; but this is a very different thing from letting the whole force out of hand before we come within such distance.

Returning to the comparison already made with the individual combat—if a man rushes at us frantically with his head down when half a dozen yards off, we have only to step quietly aside, and let him run his head against the wall, or else take him in flank or rear as he passes.

If it is wrong to change our position of attack when once within distance, it is not only wrong but absurd to strike when out of distance. All that has been written on this subject, inculcating the necessity of rapid decision and rapid movement, with reference to the action of cavalry, has led to the idea that the moment we catch sight of the enemy, or gain information of his locality, we should at once wave our swords over our heads, stick spurs into our horses' flanks, start *ventre à terre* without further consideration, and never pull bridle till we have run our heads into a battery, or at least got ourselves well into the cross fire of squares in échelons and artillery in position. If on the road we should ride over the enemy, of course it will be so much the better.

In the individual combat we should never take our eye off our antagonist for a moment, and while we conceal all indications of our own purpose, and all movements of hand or eye which might betray our intentions, we should closely watch every movement, however slight, of our adversary; at the same time preserving a position which will permit free muscular action in all directions, so that at the moment when a quick glance of the eye detects an opening, and the impulse to strike arrives, we may not be off our balance, and unable to seize the opportunity, but, on the contrary, may find our hands and legs in the right places to answer the impulse with effect; and when we do strike, the immediate recovery of balance and position must be habitual; otherwise, if the attack fails, or is even partially successful, and we have thrown ourselves completely off our balance in our eagerness to strike, we shall remain for the time being completely at the mercy of our opponent.

While we strike with one hand, we must prepare an attack or defence with the other.

The separation of the ranks in the attack gives us a facility in copying this feature of the individual combat in our cavalry movements, which we should not otherwise possess, and also enables us to employ our artillery to the last moment preceding the actual assault; whereas it would be absolute temerity to attempt such a venture, if we had not a ready support at hand, to protect the limbering up and cover the retreat.

Neither in the individual combat, nor in the encounter of bodies of cavalry in the field, can we determine the immediate mode of attack long beforehand; the movements in both cases are too rapid and uncertain to admit of any such proceeding. In the one case, we must keep the whole muscular system completely under control, and all our members ready to answer the impulse of the will upon the shortest notice, and to act upon the shortest lines of movement, either for attack or defence, until the moment for attack arrives; when the rapid glance, the quick thought, and the heavy blow should succeed each other, at intervals of time so indefinitely reduced, that the three motions should become one. And in the other case, we must keep our lines of cavalry and our artillery well in hand, and completely under control, all our forces ready to answer the impulse of a single will upon the shortest notice, and to work either for attack or defence upon the shortest and most effective lines of movement, until the propitious moment for delivering the assault arrives, when the opening should be seized at once, and the rapid glance and quick decision of the leader should be followed so quickly by the impetuous rush of the attacking force, that the thought and act should become one.

Beyond this point, the analogy between the movements of the individual combat and the action of cavalry in the field is not so close.

The impression upon the senses, the consequent impulse of the human will, and the action of the muscular system, are so intimately and wonderfully connected, that in a single moment, after the first attack, we are again on our balance; and a second attack, or parry to the return, or counter attack, follows as quick as thought.

Bodies of cavalry and horse artillery, and human muscles and members, are different things. The former are not nearly so manageable or so much under our immediate control as the latter, and a certain time must be allowed for getting some hundreds of excited men and horses again in hand when the reins have been once shaken. The torrent must be allowed to flow in one direction or the other for a few seconds, and therefore the force, by means of which the blow has been inflicted, becomes temporarily paralysed, and unequal to a second effort.

But the analogy still holds good to a certain extent; for, as in the one case, when we have struck out with one hand, we have our remaining hand ready for the following blow, or for a parry to the counter; so, when we have attacked with one rank, we still retain the other in hand to follow up a success, or to parry a counter attack, and to support and defend our artillery.

We shall commence by supposing an attack of infantry, when the point of attack may be considered stationary. The advance is to be made exactly as already described, (the artillery taking up successive positions at distances from each other of 240 yards,) until arrived within charging distance, when the distance (240 yards) between the last two positions of the artillery will be passed by the cavalry at the trot instead of at the walk. This will occupy 60 seconds, allowing time for two rounds of round shot, or three rounds of canister.

Immediately upon passing the last position of the artillery, the cavalry will take up the gallop. Or if the artillery should be brought up to closer range, the last 240 yards between the positions of the artillery might be passed, one half at the trot, and one half at the gallop, occupying 50 seconds, and allowing time for one round of round shot, and one round of canister.

In this case the artillery, while coming into action in the last position, must be protected as much as possible by the fire of the artillery in rear, directed against the portion of the line in the vicinity of the artillery in the advanced position, and the infantry fire must also be diverted by other means if possible.

The impending attack of a large body of cavalry will be likely to divert the fire, and render it unsteady and ineffective. The infantry being extended in a line formation of some kind, and threatened or attacked in different points, and so their attention being distracted, it is probable that the fire will not be concentrated upon the artillery, and that the latter will only have to deal with the portion of the line in their immediate neighbourhood. The fact of the infantry being in a line formation would imply that they were more or less taken by surprise.

An attack of cavalry, supported by artillery, in order to effect this purpose, might be made within short distance, as follows:—

At about 400 yards from the point at which the cavalry are to commence the charge, the artillery gallop to the front at 10 yards per second, one portion describing 180 yards, and the other 420 yards. At these distances they come into action, the two positions of the artillery being 240 yards apart.

At 40 yards from the first position, the cavalry take up the trot; at a point half way between the two positions, the gallop is taken up, and from the last position of the artillery the assault is given.

At the usual rate of 8 yards in a second, the 420 yards would be done in 52 seconds; but at the present rate they are passed over in 42 seconds, by which means 10 seconds are saved.

The cavalry may, in consequence, pass over the 40 yards at the trot in 10 seconds, instead of at the walk in 20 seconds, and there will still be the same time available for coming into action, in the latter case as in the former. Therefore the artillery in the advanced position will be in action at the moment that the cavalry pass the first position.

The 180 yards will be described in 18 seconds, during which the cavalry will describe 36 yards at the walk, leaving 104 yards to be done at the walk in 52 seconds, and 40 yards at the trot in 10 seconds, making in all 62 seconds, which will give ample time for the artillery in the first position to come into action, and deliver one round of shrapnel or round shot, to protect the coming into action of the advanced artillery.

The passage of the 240 yards, one half at the trot and the other half at the gallop, will occupy 50 seconds, allowing ample time for two rounds of canister, or one round of round shot, and one of canister.

Charging squares.

In charging squares, if we could open the road for the cavalry by the fire of the artillery, without too great a risk to the latter, it would be very advantageous; for the mass of infantry in square, being first shaken and thrown into disorder by the fire of artillery at close range, and immediately afterwards attacked by the cavalry on one or two faces, would probably be thrown into a state of confusion, which would prove fatal upon the attack being repeated.

But in order to this, the artillery should gallop upto within 250 yards of the square, unlimber, and load, within close range of the concentrated fire of a great portion of the infantry rifles; and this, as matters stand at present, would be rather a hazardous proceeding.

With artillery at close quarters, and a cavalry attack immediately impending, men do not fire as coolly as if they were firing at a target; still, artillery gunners and horses are too valuable to be exposed to great risks without some very sufficient reason.

We must therefore relinquish the idea of opening the attack with the artillery, and content ourselves with using it as a powerful support to the third and subsequent attacks, in the event of the first and second unsupported attacks of the cavalry proving failures.

The following arrangement is therefore proposed:—

The squadrons to be in open column at full distance, which, taking the strength of squadrons at 48 files, would be 60 yards. The artillery to be on the flank of the third squadron. The column, moving at the trot, upon the signal to attack, the artillery gallop 240 yards to the front, at the usual rate of 8 yards per second, and halt to come into action. Just at this moment they will, by the passage of the first squadron to the front, be masked from the fire of the infantry, which will be also diverted by the cavalry attack.

The first squadron attacks:—allow 30 seconds for the attack and clearing the front.

The second squadron arrives in line with the artillery in 15 seconds, and attacks as did the first squadron. The second attack will therefore succeed the first in 15 seconds. Upon the second squadron passing the artillery, and commencing the attack, the remainder of the column pull up to the walk.

It may be calculated that the two attacks will be made in less than a minute, during which time the artillery will have unlimbered and loaded.

During the 30 seconds occupied in the attack of the second squadron, the third squadron will have arrived in line with the artillery, when one round of canister may be delivered.

The third squadron then attacks, as did the first and second; allow 30 seconds also for this attack, and clearing the front; during which the fourth squadron will have arrived in line with the artillery, when a second round of canister may be delivered, followed by an attack of the fourth squadron, and so on.

In case of any momentary check in clearing the front after an attack, the artillery must reserve their fire for a second or so, and the attack must not be given till the round of canister has been delivered; but this would amount to nothing more than a momentary halt of the column.

Flank attack of infantry.

When a flank attack is intended, if, upon reaching the prolongation of the alignment of the enemy's position, we should find the infantry in a line formation perpendicular to such line, the attack would be conducted as already described, the first position of the artillery being taken on the inner flank, or wheeling point, previous to the change of direction of the line of movement of the attacking force. This places the front opposite the point of attack, and perpendicular to the alignment produced. The artillery remain in action during the change, and until masked by the subsequent advance of the attacking force on the new line of movement.

If we should find the enemy in process of formation of any sort, and unprepared, the great point will then be to close with him as quickly as possible.

But however desirable this may be, we must not, at least as far as the main body of the attack is concerned, let our anxiety to close lead us to break our formation, or impede the action of the artillery; otherwise we lose the great advantage of being in an effective formation and well in hand, while the enemy are in disorder, and in a state of transition from one formation to another. If we lose our own order in the hurry to attack, we become on equal terms with the enemy in that respect, as both the attacking party and the attacked will be in disorder.

The oft-repeated axiom, that in cavalry movements the propitious moment once lost is never to be recalled, is perfectly true, and if we surprise the infantry in movement with comparatively small bodies of cavalry without artillery, there is nothing like rushing upon them at once; even then, however, it is better to take it a little coolly at first, particularly if we see we are sure of them, and to occupy a second or so more in the advance, rather than come amongst the enemy with blown horses, exhausted men, and broken ranks.

But the case at present under consideration involves the movements of comparatively a large body employed in the flank attack, accompanied by artillery; and the sort of attack just alluded to might be made by skirmishers and detached parties, pending the attack of the main body. One regiment would complete the change of direction in about 55 seconds, and about 36 seconds might be added for each additional regiment. This would give time for the artillery on the inner flank to come into action, and fire one, two, or three rounds, according to the strength of the force effecting the change.

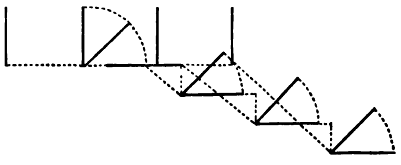
The next position of the artillery at 240 yards in advance, might be taken at the fast gallop (10 yards in a second), in which case the 240 yards would be described by the artillery in 24 seconds, while the cavalry would describe the same distance at the trot in 60 seconds.

The difference (36 seconds) being added to the 55 seconds already mentioned, will give 91 seconds for coming into action and delivering three rounds of canister within 240 yards of the enemy. The artillery should be well escorted, and the cavalry, upon passing and masking the artillery, take up the gallop, and charge over the last 240 yards, gradually increasing the pace.

We may find the infantry ready formed in squares to receive us, and if in échelon of squares, having selected the unflanked faces of the flank square, a very simple movement will place us in a correct formation for the attack.

The force composing the flank attack having arrived on the alignment of the enemy's position in direct échelons at half distance, the left leading as already described, instead of receiving the signal to reverse the échelons, will receive the signal 'Left,' and then the signal to wheel. All the squadrons wheel the eighth of the circle (45°) to the left (the outward or reverse flank); this places them for the moment in oblique échelons overlapping each other. The leading squadron will then receive the word of command to continue the wheel till the quarter circle is completed, which places the front of that squadron perpendicular to the line of attack; the remaining squadrons continue the forward movement after the completion of the wheel, till they reach the line of movement of the inner flank of the leading squadron, when a second wheel of the eighth of the circle (45°) places each successively in column at full distance on the line of attack.*

Fig. 54.



The artillery takes post on the flank of the third

* Appendix, note 22.

squadron, and the attack is made as already described in the attack of squares.

Attack of cavalry.

In the attack of cavalry, the opposing bodies are both in movement, and gradually approach each other, increasing the velocity as the distance between the two bodies diminishes, until the velocity reaches a maximum and the collision takes place.

It has been already shown that, to a certain extent, the position of the point of contact is at our disposal, upon the supposition that we can increase or diminish our own velocity at will, to correspond with the velocity adopted by the enemy, either by assimilating our own velocity to that of the approaching force with as much exactness as such a practical matter will admit of, when the point of contact will be, practically speaking, in the centre of the line of movement; or else by employing for a time a velocity less than that of the enemy, in which case the point of contact will be nearer to our own position at the commencement of the movement than to that of the enemy.

We will, in the first place, take the more simple case of the two, and suppose that the two moving bodies approach each other with the same velocity, whether uniform throughout or variable, and that consequently the collision will take place in the centre of the line of movement.

We shall suppose our cavalry in a line formation advancing, as already described, supported by artillery, and taking up successive positions at 240 yards apart, the coming into action of each portion of the artillery being protected by the fire of the other, Upon approaching the point where, with reference to the distance of the approaching force of the enemy, our own attack should commence, the last position of the artillery is taken up at the usual distance; the only difference in this movement being, that the distance is described at the fast gallop (10 yards per second), instead of the gallop out (8 yards per second), the 480 yards being passed over in 48 seconds, instead of 60 seconds; this gives 12 seconds to spare.

At about 50 yards from the last position but one of the artillery, the cavalry take up the trot. This 50 yards will therefore be done in 12½ seconds, instead of 25 seconds, which, practically speaking, just accounts for the 12 seconds gained by the fast gallop of the artillery. Therefore, in this case also, upon reaching the last position but one of the artillery, the artillery in the advanced position will be in action as usual.

The 240 yards between the last position but one and the last position of the artillery, will be passed, 120 yards at the trot in 30 seconds, and 120 yards at the gallop in 20 seconds, in all 50 seconds, which will allow ample time for one round of round shot and one round of canister, just previous to closing with the enemy.

The distance of 240 yards between the last position but two and the last position but one of the artillery will be done, as already stated, 190 yards at the walk and 50 yards at the trot, occupying in all 107½ seconds.

Three rounds of shrapnel or round shot can be delivered in 90 seconds; therefore, during the advance of the cavalry, between the last position but two and the last position but one of the artillery, three rounds will be delivered from the artillery in the last position but one.

Upon a reference to the Appendix, it will be found that, supposing the point of collision to be at a distance from the last position of the artillery of 120 yards, the first round will be delivered from the last position but one of the artillery at a distance of about 900 yards from the enemy.*

The last round from the same position will be delivered at a distance of 480 yards; the first round will be delivered from the last position of the artillery at 360 yards; and the last round of canister will be delivered from the same position at 240 yards from the advancing enemy; followed, in less than 10 seconds, by the shock of the charge from our cavalry, leaving no time to recover from the disorder and confusion produced by a charge of case at close range, when in full career to meet the attack; to say nothing of the previous rounds delivered at gradually diminishing distance from the last two positions of the artillery.

This is upon the supposition that the attacking forces preserve an approximation to an equal velocity throughout, and consequently encounter each other in mid-career, the point of collision being the centre of the line of movement, or nearly so.

But it may be that we see, at the commencement of the movement, that the enemy has put on steam too soon, and that, if we only allow him to run his full course, he will come up to the encounter with blown horses and disordered ranks. In order to profit by his mistake, we have only to make a slight modification of the arrangement just described.

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* Appendix, note 23.

Let it be supposed that we observe the enemy take up the gallop about 1,200 yards off: then, instead of moving the artillery from the nearest position forward, the usual distance of 480 yards, being 240 yards beyond the position of the artillery already in action, we may halt them half way at 240 yards, and thus mass the whole artillery together for the reception of the enemy upon his arrival within close range.

This will be attended with no difficulty whatever, and will be productive of no confusion; for a simple order to form on the artillery in action will be sufficient, without further explanation. The rest of the movement up to the position of the artillery will proceed exactly as before. The 240 yards, of which 190 are passed over at the walk, and the last 50 at the trot, will be described as before in 107½ seconds; during which time, the enemy, moving at the gallop, may be supposed to have moved 645 yards; which brings him within 315 yards of the artillery. He will, therefore, receive during his advance one round of the concentrated fire of the whole of the artillery at 436 yards, and a round of canister at 315 yards, immediately succeeded by the attack of our cavalry, who, having trotted 50 yards up to the artillery, charge over the last 157 yards up to the point of collision with the enemy.

It would be endless, as well as useless, to suppose all the cases which might occur in practice; enough has already been said to show that, when working according to the system proposed, both arms can be kept well in hand to the last moment of the attack.

It will only be necessary to keep a watchful eye upon the movements of the enemy, to judge as nearly as possible the distance at which he is and the speed with which he is approaching, and to modify our own arrangements accordingly.

The artillery will always have the same thing to do up to the last moment preceding the attack, namely, to gallop forward 480 yards at a certain rate, come into action, fire 4 rounds, and then gallop forward the same distance again; by which means the two positions, into which the artillery has been divided, take up successive positions at 240 yards apart; and this will continue to the last moment preceding the attack, when an order to increase the velocity over the last 480 yards, or to mass the artillery at 240 yards, according to circumstances, will determine the remaining movements of the artillery in support of the attack. The time available for withdrawing the artillery during the attack of the cavalry will be, as already stated, dependent upon the range at which the last round is delivered. In the last instance this range was 315 yards, and consequently the distance of the artillery from the point of collision 157 yards.

It may be supposed that this distance is passed over to the attack in 20 seconds, and that, in the event of a reverse, it would take about the same time, including the moments which may be supposed to elapse during the actual collision of the lines, for the torrent to rush back upon the position of the artillery; in all 40 seconds. Within 30 seconds the artillery may be limbered up; but the second or rear rank, formed in échelons, with plenty of room between the ranks of the échelons for the passage of the first or front rank if necessary, and with the leading rank of the échelons approached near the artillery, having taken up the walk upon the attack of the first line, will afford an efficient support to the artillery, if attacked, or will effectually cover the retreat to a position in rear, if that movement should be ordered.

The more we increase the distance at which the last round preceding the attack is fired, the more time will then be available for withdrawing the artillery. It is well known that if cavalry remain halted to receive an attack, they commit a fatal mistake, and under all ordinary circumstances the cavalry should move rapidly over a certain distance, to gain the requisite impetus.

But a much more effective attack could be made after a trot of 50 yards, and a short charge over from 100 to 200 yards, than after a long gallop of 1000 or or 1200 yards. If a man has to jump across a brook, or perform any other feat which requires an impetus, he does not in general run half a mile in order to gain it.

If, during the retreat by alternate squadrons, an attack to the front should be determined upon, it will be only necessary to form line upon the squadrons formed at the rearmost position of the artillery, leaving the artillery in the advanced position still in action.

Flank attack of cavalry.

With regard to a flank attack, upon approaching the prolongation of the alignment of the enemy's position, we have, in the first place, as already described, to change direction, so as to place the front of our own force perpendicular to such line.

Previous to the commencement of the change, one portion of the artillery will take up a position on the inner flank, or wheeling point, and the other portion will gallop forward at the usual rate, 120 yards (one-quarter of the usual distance), and take up a position in advance.

Upon the suppositions previously made, the change will occupy 55 seconds, 36 seconds in reversing the échelons, and 19 seconds in the two wheels; this will give time for coming into action and firing one round. If, upon the change being completed, we suppose that our line of cavalry trots over 120 yards, up to the advanced position of the artillery, this distance will be described by the cavalry in 30 seconds, whereas it was described by the artillery in 15 seconds; therefore, there will be the difference (15 seconds) to be added to the 55 seconds occupied in changing the direction of the line of movement, making in all 70 seconds. This will give time for coming into action and firing two rounds of canister.

And upon the supposition that the enemy was originally distant 480 yards, and that, while we advance 120 yards, he has advanced an equal distance to meet us, these two rounds will be delivered at a distance of 240 yards, followed by a charge over the last 120 yards to the point of collision with the enemy.

If there should not be time to take up an advanced position with a portion of the artillery, we must only mass the whole of the artillery at the wheeling point, deliver as many rounds as possible during the advance of the enemy, and charge immediately upon the change being completed, at the moment that the enemy's line is shaken by the close fire of the artillery in mass.

All this is upon the supposition that we find the enemy's cavalry actually formed in line at the extremity of the flank of his position, and advancing to the encounter, upon our approaching the prolongation of the alignment; but this is a most unlikely case to exist, for it has been already shown, that only a very few minutes will intervene from the moment that our intention of making a flank attack becomes apparent, to the moment of our arrival on the prolongation of the alignment.

However well in hand, or well prepared the enemy's force may be, still the conveyance of orders, the necessary movements and formations, &c., require a certain amount of time; and the probability is, that at most we shall find the enemy's cavalry moving up to the flank to form and meet our attack, and that we shall have ample time to conduct the attack in the usual way, the artillery taking up successive positions at 240 yards apart. If we should see the enemy's preparations for our reception in an unexpected state of forwardness, or if the attacking force should consist of a greater number of squadrons than that supposed, it might be better to prolong the diagonal movement until the prolongation of the alignment is reached, by which means a distance will be gained for the attack, equal to the distance between the two forces at the commencement of the flank movement.

The greater the force composing the flank attack, the greater will be the time occupied in performing the change of direction, and consequently the longer will be the time disposable for the action of the artillery on the flank, and the greater the number of rounds delivered.

All these arrangements must depend upon the circumstances of the moment: all that can be done previously is to get the team well in hand, and give the reins to some one who knows how to handle them.

CHAPTER XIV.

SKIRMISHING.

Cavalry skirmishing has been discarded.

CAVALRY skirmishing has long been considered ineffective. Warnery has said that 'Hussars will sometimes keep up a scattered fire for a whole day with very little effect.' Other authorities have made similar statements, and our own experience seems to have confirmed them. It has therefore become the generally received opinion, that no effects are to be expected from cavalry skirmishing.

Reasons for reconsidering the question.

But since this experience was obtained, and since cavalry skirmishing (except as a means of covering movements, reconnoitring ground, and watching the enemy) was condemned and discarded, circumstances have somewhat changed. Modern improvements have rendered the artillery more effective than formerly, and we must look about us for the means of counterbalancing the great superiority gained by this arm. The contemporary improvement in the construction and practice of small arms suggests itself at once as one of the means of attaining this end.

Detached parties and skirmishers are not, as a rule, fired upon by artillery, and even if it were otherwise, the number of small marks exhibited would distract the fire and render it ineffective. Therefore, the approaches of the skirmishers are made in comparative safety; and, when once arrived within the range of their own small arms, they may not only disturb and check the fire, but also cripple the action of the artillery by picking off the gunners and horses.

In taking up a position, infantry skirmishers may secure themselves against the attacks of small bodies of infantry, when not in sufficient strength to oppose them, by making a timely retreat upon their supports. It is to be supposed that our skirmishers can move as fast in retreat as the body approaching to the attack. Therefore, so long as they are nearer to their own supports than to the enemy, they may be considered safe. But if the attacking parties are composed of cavalry, this no longer holds good; and in order to secure a safe retreat, our infantry skirmishers should be at a distance from their supports inversely proportional to the relative velocities of the attacking and defending parties. This would involve either an undue exposure of the supports, or else would increase the range to such an extent as to render the fire of the skirmishers ineffective. In this case, therefore, the infantry skirmishers must secure themselves by occupying broken and difficult ground, inaccessible to cavalry. According to our present mode of skirmishing, this latter means of defence is excluded when the skirmishing body is composed of cavalry; but upon the supposition that our own cavalry skirmishers can move as fast as the attacking parties of cavalry, so long as the skirmishers are nearer to their own supports than to the enemy, they may be considered safe.

Alleged objections to cavalry skirmishing.

The principal disadvantages attending cavalry skirmishing, which are supposed to render nugatory the effects of this mode of fighting, are as follows:—

1. A mounted man in the open forms a large and conspicuous mark to fire at; and so long as he remains mounted, it is supposed that he cannot avail himself of the cover which might be afforded by the circumstances of the locality in which he is to act. He will therefore be in this respect on unequal terms with the infantry skirmisher, who can not only take advantage of every description of cover, but can also fire kneeling, sitting, or lying down.

2. Formerly the arms of the cavalry man were of an inferior description, and of shorter range than the infantry rifle; and therefore in this point also the cavalry skirmisher laboured under a disadvantage.

3. The aim of the cavalry skirmisher is so disturbed by the unsteadiness of his horse, that he cannot calculate upon hitting his mark with sufficient certainty to make his fire in any degree formidable.

Such are the principal disadvantages.

The advantages are the following:—

Advantages of cavalry skirmishing.

The cavalry skirmisher can arrive at the point of action more rapidly than the infantry skirmisher; being also able to retreat more rapidly upon the support, he can venture further in open ground with impunity than the infantry skirmisher, who takes a longer time to retreat over an equal distance.

A mounted man need not be a conspicuous target.

According to the present system, as a counterbalance to the first disadvantage, the cavalry skirmisher is kept constantly in motion while loading, &c., and he only halts for a moment to deliver his fire. By this means he affords a moving, instead of a stationary mark to the fire of the enemy, except for the moment during which he discharges his carbine.

As a general rule, a moving mark is more difficult to hit than a stationary mark ; but if the moving mark passes and repasses the same point with a moderate velocity, it would be only necessary steadily to cover such point, and pull the trigger just as the moving body was about to pass. A rifleman posted under cover, and at long range, might have full time and opportunity to take this course.

Most men, if firing at long range, would prefer a shot at an antelope or other animal when moving at a walk, and broadside on, than when end on and stationary.

Although a mounted man cannot get under cover as the infantry skirmisher can, still there are means by which he may disconcert the aim of his adversary. For instance, by placing himself end on, or facing the enemy, he reduces the breadth of the target by two thirds. If he cannot place himself behind a tree, wall, ridge of ground, &c., he may be able to place himself in front of such objects, or in shadow; and those who have taken long shots, will know how a background may confuse the sight and disturb the aim. At all events, he can, in all ordinary cases, avoid taking up a station on a ridge, with the light clear behind him.

When fire-arms are not to be used, keeping in constant motion may do very well; but as matters are conducted at present, such constant motion seems to have a tendency to make the men unsteady and impatient, and to keep the horses in a continual fidget; and this is not conducive to accuracy of aim and effective firing from horse-back. But there is no absolute necessity that the cavalry skirmishers should always remain mounted. Asiatics, and men of other nations, manage to get out of their saddles and to get into them again very quickly; thus gaining the double advantage of proceeding rapidly to the point of action, and of firing coolly and steadily from behind cover, when arrived at that point. How this may be effected will be found detailed in Captain Nolan's 'History and Tactics of Cavalry,' page 278.

The cavalry soldier has a better arm now than formerly.

The second disadvantage mentioned may be removed to a great extent, by furnishing the cavalry skirmisher with a better arm (as we have done), combining lightness with an extended range, or even by increasing the weight of the arm carried by the troops specially destined and trained for this particular service.

We will not enter further into all the arrangements which may be made to render the cavalry skirmisher more efficient, and his fire more effective than formerly; and to adapt a certain portion of our troops to the duties which may be required of them, in order to constitute them one of the means of bringing forward our improvements in small arms, so as to compensate the great additional power obtained in artillery practice.

Proposed system of producing accuracy of fire.

We will confine ourselves merely to one branch of the subject—that is, to the best means of counteracting those causes which produce the third disadvantage mentioned, viz., the inaccuracy of aim and inefficiency of fire caused by the unsteadiness of the horses.

Unsteadiness is produced by the following causes:—

1. The horses have been so accustomed to work in the ranks, that, while skirmishing, they are in a continual fidget and anxiety to get back again. Horses that have been always accustomed to work at close files, will be shy and awkward out of the ranks.

2. If the rein is held in the hand while firing, even when the hand is run up and the rein is loose, a certain muscular and involuntary action of the left arm, in firing, will be communicated to the rein, and from the rein to the bit, at the moment that the trigger is pulled. The horse will expect this action, and this expectation will probably lead him to keep his head in movement, and the muscles of the neck in action, thus preventing that temporary repose of the whole muscular system of the horse, which would enable the rider to take a steady aim.

This will be more the case with irritable animals than others, and is produced even more by the action just alluded to, than by the dread of the flash or the noise of the explosion.

3. At ball-practice, the horses are brought in front

of targets, and are surrounded by objects which tend to make them timid and unsteady.

4. The mode adopted for extension tends to excite and irritate the horses, and to bring them up to their skirmishing-ground in a fidgety and excited state.

It is proposed to get over the first difficulty by adopting the course pursued successfully in the 15th Hussars in India, which was as follows:—

During the first training of the remounts, at the end of each riding-school lesson, a certain number of horses were formed up in rank entire, and a man was called to the front by name, who moved out of the rank to the front, halted at a short distance, and remained perfectly still, throwing the reins on the horse's neck, and making much of him, giving him a handful of grain, and accustoming him by degrees to the snapping, and subsequently to the firing of carbine and pistol off his back, leaving the reins on his neck while using the fire-arm. The horse may then move about a little, and presently return to the ranks. By this means, the horses will be taught from the commencement to be content when out of the ranks, and to stand still when fired off.

Dropping the rein while firing, as described, will get over the second difficulty. Horses which cannot be trained to this are the exceptions, and should not be selected for skirmishing purposes.

As to the third difficulty, if the men in the first instance learn thoroughly the use of the weapon they are to employ, including judging distances, &c., while dismounted, and if the horse learns to stand still while his rider takes aim and pulls the trigger, when firing with blank cartridge, a very little mounted ball-practice will suffice; and a little trouble will enable us to accomplish this in most localities without frightening or irritating the horses.

Proposed system of extension of skirmishers.

We now come to the fourth and last difficulty—the extension.

According to the present system, when the signal to extend is given, the skirmishers spread out at once in a single rank, at intervals in our service of about 20 yards, and in the French service of about 5 mètres, these distances being of course varied according to circumstances.

The skirmishers work at a distance of about 150 to 200 yards from the supporting body, and when there is an intermediate support between the skirmishers and the main body, it is generally at a distance of about 100 yards.

This is the general rule in most services, to be modified according to circumstances.

We shall now consider what each man has to do during the extension from a given point, and, for the sake of example, we shall suppose the extension to be made to the right; in which case, the left becomes the point from which the extension is made.

Upon the signal being given, the men are supposed to move out smartly and at once; that is to say, they are to extend at a fast gallop, and if there is a little dash about the movement so much the better, as it is supposed to indicate smartness and quickness in the men, and to show that they can ride their horses.

The horses soon get accustomed to this sort of thing, and expect it; the moment the men begin to unstrap and load their carbines, the irritable and excitable horses begin to fidget; and when the signal is sounded, and the spur given, they start off, bolting, sidling, pulling, prancing, and all more or less in a state of excitement, which ill prepares them for the subsequent manœuvre of halting for a moment, while the rider takes aim, and fires off their backs.

At a fast gallop, and under the circumstances described, the skirmishers all move away to the right, with the exception of the left-hand man, who remains halted or moves straight to his front. As the man next to the point of extension gets his distance, he turns and aligns with the left file; the next man to him, when he has got his distance, does the same; and so on in succession.

As the men ride away towards the right, the point from which they have to judge their distances is behind them; consequently, while riding forward to the right, the men must look over the left shoulder to judge their interval, and, in order to effect this, they must twist their necks, and partially sway their bodies round in the saddle.

This attitude, while at the gallop, is uncomfortable to the horse as well as to the man; it throws the horse off his stride, impedes his action, and destroys the balance of the rider.

The horses do not know what the riders are about, and consequently do not accommodate themselves to the movement.

If a skirmisher is pursued, he must turn in his saddle to fire; but, in this case, the action is but momentary while he delivers his fire, and the horse, if he has been trained, knows perfectly well what his rider is about. But, in extending, the men must continue in this constrained position, keeping the rear point in view, till the extension is completed. Add to all this, the many pulls and checks involuntarily given to the bridle, as well as the involuntary action of the heel and spur while riding in this way, and the sum-total will be quite sufficient to irritate even a quietly-disposed horse, and to render him impatient and averse to being fired off.

Unless in a case of absolute necessity, such as firing to the rear when pursued, &c., the men in all movements should look to the front, and sit straight in their saddles. A man riding in the way described, if not very careful, will produce an action of the bit, which he is unaware of at the time, but which may be most annoying and painful to the horse.

When the extension has been completed by this process, it will generally be found that some of the intervals in the centre of the line are false; and then follows a certain amount of riding about, correcting intervals, and shouting to bring back any number of skirmishers who may have gone away too far to a flank, which is all most probably occasioned by some man, on account of the unsteadiness of his horse, and his own bad riding, not being able to gallop in one direction and look in another.

Detail of the movement.

The first thing therefore to be attained is, that the movement should be so made as to admit of the men sitting straight in their saddles, and of their looking in the direction in which they have to ride, and this may be attained by the following arrangement:—

A non-commissioned officer to be placed on each flank of the body about to extend, who has learnt to judge an angle of 60°, or two-thirds of a right angle, which is a very simple matter, and may be learnt without the least difficulty.

Let it be supposed, as before, that the extension is made to the right.

Upon the signal or word of command being given to extend to the right, the non-commissioned officer on the right moves, at the angle stated, and with the increased velocity ordered, upon a diagonal line; the non-commissioned officer on the left, and the remainder of the skirmishers, moving straight to the front with a lesser velocity.

The right file keeps the non-commissioned officer moving on the diagonal line in view, by a glance of the eye and a slight turn of the head; and when the correct distance is gained by the oblique movement of the non-commissioned officer, the right file turns upon the diagonal, and moves upon a line parallel with the line of movement of the non-commissioned officer, always preserving the same distance from him during the extension. Each file turns when the file on his right has gained the correct distance, and so on in succession, until the extension is completed; when, upon a signal given, all turn to the front with correct intervals, and dress to the point of direction.

It will be observed, in the first place, that according to the proposed arrangement, the skirmishers extend gradually and successively during the advance, instead of spreading out at once, as ordered in our regulations.

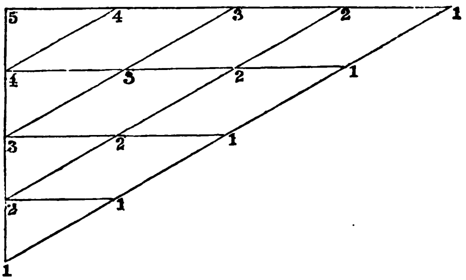
The men have to look for interval and dressing to their right front, which a glance of the eye and a very slight turn of the head will enable them to do, without altering their position or deranging in the slightest degree their seat on horseback, or the aids to be given to their horses.

They need not trouble themselves about what is going on to their own rear, and they will have no occasion to look back, or divert their attention from the proper point of dressing, till the extension is completed, when they all turn together, and dress to the directing hand.

Dashing about in skirmishing order may have a very imposing effect, but true rapidity of movement is to be estimated by marking the time elapsed from the moment the extension is commenced, to the moment that it is correctly completed, and that the skirmishers are prepared and ready for renewed action of any description.

If we make the faster pace during the extension double the slower pace, the skirmishers moving on the direct line *c a*, and its parallels, (Fig. 56.) will always remain in line with the skirmishers moving at an increased pace on the diagonal *c b*, and its parallels.* Therefore, if the advance is made at the walk (2 yards in a second),

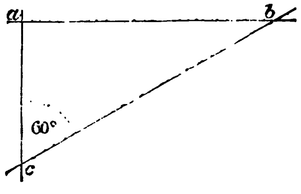
Fig. 55.



the extension must be made at the trot (4 yards in a second); and if the advance is made at the trot (4 yards in a second), the extension must be made at the gallop out (8 yards in a second). The extension will be completed, while the point from which the skirmishers extend (in the present case the non-commissioned officer on the left), passes over a distance of little more than half the line of skirmishers when extended; and this distance in practice may be taken as half the line of skirmishers.

If the extension is made from the halt, it will only

Fig. 56.



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* *c b*, the cosecant of 60° = twice *c a* the cotangent of 60°; and *c a* = ·577 of *a b* the radius. (Fig. 56.)

be necessary for the non-commissioned officer on the right to turn to the right, and move in prolongation of the line of skirmishers formed at close files. As he moves off, the right file turns to the right, and moves off in turn, when the distance is gained; and so on in succession; and upon the signal being given, all turn to the left and dress to the directing hand.

The time occupied in the extension may be easily ascertained by multiplying the number of files by the distance or intervals between files, and dividing by two, which gives the distance described by the directing point during the extension. This again, divided by two, if the advance is made at the walk, and by 4, if the advance is made at the trot, will give the time in seconds occupied in the extension.

Application of the system.

If we take a regiment of 4 squadrons, each 48 files strong, the front will be 228 yards, and if the line of skirmishers outflanks the regiment about 100 yards, the line will be 428 yards. Therefore, if a flank squadron moves out about 100 yards to the front, and the skirmishers advance to extend from that point, the extended line from that point towards one flank will be 328 yards.

Hence, while the directing point advances 164 yards, the extension will be effected.

About 21 or 22 files will cover the front; consequently, if the squadron advances about 100 yards to the front, and then one half extends and the other half forms the support, the extension will be effected at 164 yards from the support, in 1 minute 22 seconds when the advance is made at the walk, and in 42 seconds when the advance is made at the trot.

Uses of cavalry skirmishers in the field.

Cavalry skirmishers may be employed as moving videttes, in front of the advanced guard or main body, at extended intervals, and at a considerable distance in front; or to reconnoitre ground in front of an advancing line, and immediately preceding an attack; in which case, they may prove of much use in discovering ambushes of the enemy, or in detecting difficult ground, which, although not apparent from a distance, might check the advance, and cause the attack to fail; or to cover and conceal movements of our own troops, in which case the intervals should be reduced so as to make the screen as thick as possible; or to attack in skirmishing order; or to cover a reconnaissance; or, finally, to use their fire-arms against the enemy's artillery or other troops.

As a rule, the artillery do not fire upon skirmishers or small detached parties, but we cannot advance large bodies of skirmishers to the front without strong supports within reach, and upon such supports the artillery may direct their fire.

The more the artillery attain to accuracy of aim at long range, the further off must we hold our supports.

The longer the range of our small-arms, the greater will be the distance from the enemy at which the effective action of a line of skirmishers may be calculated upon. Therefore, the improvements in small-arms will enable us to bring a line of skirmishers into effective action at a greater distance from the enemy than formerly.

The greater the speed with which the skirmishers can retire upon the supports, and the supports upon the main body, the longer will be the distance from the main body to which the skirmishers may venture to advance against the enemy; consequently, on this account, cavalry might be preferred to infantry, particularly in attacking the artillery in comparatively open ground.

To render cavalry skirmishers efficient, when using their firearms, requires some nicety of arrangement, management, and training; but if this could be accomplished, cavalry skirmishers, well armed and mounted, might do valuable service, when employed as one of the means to counteract the preponderating effect of the artillery of the present day.

CHAPTER XV.

SIGNALS AND WORDS OF COMMAND.

Trumpet sounds may be indefinitely combined.

WE can form an infinite number of combinations of the trumpet and bugle sounds.

In the first place, we can distinguish the sounds by the number of repetitions of the same note. Each of the signals thus formed can be subdivided, by expressing the note in semi-breves, minims, crotchets, quavers, or semi-quavers. This alone gives an immense number of combinations; and we may go through the whole scale forming a similar combination on each note, so that we have a rich store of materials to work upon.

Simplicity the great desideratum.

Our great aim should be to make the signals as simple and unmistakeable as possible, so that all ranks may become thoroughly acquainted with them without difficulty. The trumpet and bugle sounds must evidently be employed for the general movements of the force of cavalry manœuvring under the guidance of such signals: partial indications to the component parts of such force must be conveyed by word of command, or signal by movement. A very few special and easily distinguishable signals should be adapted to the movements of the artillery when working with the cavalry; but anything beyond this would complicate the code of signals, and might produce confusion.

Detail of signals proposed.

The signals required would be as follows:—

1. Advance.
2. Retire.
3. Right.
4. Left.
5. March.
6. Halt.
7. Signal to command attention.
8. Signal of execution.
9. Signal to annul.
10. Form line.
11. Form column.
12. Form échelons.
13. Reverse the échelons.
14. Formation in alternate squadrons.
15. Threes.
16. Extend.
17. Close.
18. Wheel.
19. Walk.
20. Trot.
21. Gallop.
22. Gallop out.
23. Charge.
24. Attack.
25. Artillery to the front.
26. Artillery to support the movement.
27. Artillery to retire to second line.
28. Skirmishers out.
29. Recall of skirmishers.

It will be seen at once how these signals may be employed to effect all the movements detailed in the system proposed. Even the most powerful human voice is not sufficient to control the movements of large bodies of cavalry, and hence has arisen the necessity to repeat the words of command, which produces shouting and confusion of sounds, and requires time.

Commanding officers may have loud and at the same time clear and distinct words of command, or they may not, so there is an uncertainty about the matter, which does not belong to the system of signals by trumpet or bugle: therefore it is proposed to use words of command sparingly, and only when the commanding officer is so close to the portion of the force to which an order is to be conveyed, that he can make himself heard without difficulty.

Words of command.

Even in this matter of words of command there is room for improvement. The English language, in which consonants predominate greatly over vowels, is not well adapted for a language of words of command, and we do not appear to have made the most of it.

Scarcely anything could be worse adapted for the purpose intended than the first word generally used, 'Attention.' The moment the mouth is opened to pronounce this word, it is closed again by two "*t's*" between the first and second syllables; and the five consonants which the word contains are quite enough to smother the sound, even under the most favourable circumstances. Great efforts have been made, and various plans tried, to bring the refractory consonants under subjection, but as yet without success. ‘Attention’ has been turned into ‘At-chen, ‘Chen,’ ‘At-chon,’ ‘Chon,’ &c.; but it requires a powerful voice well under the speaker's control, and much practice, to produce any effect, even by the above contrivances.

Nothing can be more discouraging, at our first essay in giving words of command, than having to utter this preliminary word. If pronounced as usually spoken, the sound will be so confused and impeded by the three syllables of consonants, that it will probably go no further than to slightly rouse the attention of a small portion of one's audience: and if the first failure should be succeeded by an employment of some of the metamorphoses just alluded to, we shall find that without previous practice our efforts, however great, will only produce something more like a sneeze than a word of command.

In this matter a good deal depends upon the selection of the words of command to be used. The Turkish word ‘Hazir-ole,’ which is used to call to attention previous to a movement on all occasions, whether halted or on the move, struck me as particularly good. It is compounded of the Arabic participle ‘Hazir,’ meaning ‘present,’ ‘ready,’ ‘prepared,’ &c., and the imperative of the Turkish verb ‘Almuck,’ ‘to be.’ The two first syllables of this word lead to the last, which, rolled out by a powerful voice, can be heard to a great distance.

Application of the above

We will not discuss all the combinations and applications of the signals mentioned, but, as an instance, let

Signals.

it be supposed that a brigade in column of route, with artillery, is about to issue from a defile, having received from the advanced-guard information of the proximity of the enemy. For the sake of example, let it be further supposed that the open ground is on the left, and the protected flank, the right. Under these circumstances, the skirmishers having been sent out, the first signal given will be 'left,' which simply implies that the subsequent formation will be towards the left hand. Whether this signal is heard or repeated throughout the column, or not, matters little: for, as has been already frequently stated, all ranks in the column have nothing to do but follow their leaders, taking up the pace given from the front.

While the signal is being given, the commanding officer will place the head of the column, by word of command, facing the direction in which he wishes the formation to front, and according to the principles already detailed; leaving the issue of the defile free for the subsequent exit of the artillery, and room on the protected flank for its formation. The signal is then given to 'form line,' and for the 'pace' at which the formation is to be effected. This latter signal has reference to the forming portion of the column, the velocity of the base of formation being under the immediate control of the commanding officer, who remains near to regulate it by word of command. Finally, the signal of 'execution' will be given, when the formation commences. It has been already shown that, even during the process of formation, the movement may be stopped, altered, or modified, at the will of the commanding officer, without producing either uncertainty or confusion.

The four signals just mentioned will be sufficient for the line formation. It is not even absolutely necessary to repeat them, for if they are distinctly heard at the head of the column, that will be quite sufficient.

As the artillery approach the mouth of the defile, 'artillery to the front' may be sounded, followed by 'artillery to support the movement;' upon which the artillery move upon the right flank of the forming line, and act as already detailed. The remainder of the formation goes on as usual.

We shall now suppose the line formed and advancing, and that it is necessary to change front half left on the move. The first signal will be 'right,' which implies that the movement will be from the right; the next will be 'form échelons,' which always implies direct échelons of squadrons at half-distance; then follows the 'pace,' and upon the signal of 'execution,' the movement commences by the right squadron taking up the increased pace. During the échelon formation the signal 'left' is given, followed by the signal to 'wheel;' and when in échelons, upon the signal of 'execution' being given, the whole of the squadrons commence the wheel at the same moment, and move forward together upon the 'advance' being sounded.

The next signal will be 'form line,' followed by the 'pace,' and signal of 'execution;' upon which all the échelons, except the base, take up the increased velocity, and the line is thus formed on the move. If there is artillery on both flanks, the artillery on the inner flank may protect the movement as already described, or the artillery may be ordered from the right to the left.

The line of cavalry being formed, and the advance protected by the movements of the artillery, as already described, we shall suppose that an opportunity to attack occurs. It will then only be necessary to give the signal to 'attack,' followed by 'artillery to support the movement,' which will be a signal to the artillery that, at their next change of position, they are to move at the fast gallop, instead of the gallop out. The cavalry will then take up the trot, the gallop, and the charge, as already detailed with reference to the movements of the artillery. If time presses, the échelon formation might be commenced before the line formation is completed, even without checking the general advance. For instance, if the line formation was being effected by a combination of the walk and gallop, the échelon formation might be commenced at once in the formed part of the line, by word of command: the right squadron, and the others in succession, as the échelon distance was gained, taking up the trot; the remaining squadrons in succession, when formed, continuing the gallop in line till the correct échelon distance was gained, and then taking up the trot with the échelons already formed.

The combinations and applications of the signals to the movements already detailed are so simple and palpable that any further examples are unnecessary.

Proposed signal to show that the sound has been understood.

On the line of march, and on other occasions, it may be desirable to know that the signal has reached the extremity of the column, or, in field movement, the extremity or extremities of the line; and in order to this, a sound indicating that the signal is to be returned, might be found useful. In this case the signal, being given with this addition, will be repeated from front to rear, or from rear to front of a column, and back again: or from flank to flank, or from centre to flanks of a line, and back again. This will indicate to the commanding officer that the signal has been heard and understood throughout the column or line.

APPENDIX.

APPENDIX.

NOTE 1, p. 4.

Pace.

The alterations suggested in the rates of pace are not considerable; in fact, they only amount to taking the mile as 1800 yards, instead of 1760 yards in length, when the rates will be 4, 8, 12, 16, 20 of such miles per hour for the walk, trot, gallop of manœuvre, medium gallop, and fast gallop respectively.

In order to find the equivalent of this proposed rate in the usual measure of miles of 1760 yards, it is only necessary to subtract from the distance found by the method indicated above* $\frac{1}{45}$ that distance; or to add to the time so found $\frac{1}{44}$ that time.

For, generally in uniform motion,

where $s =$ space
$t =$ time
$v =$ velocity

$$s = v\,t.$$

Hence, taking the mile at 1800 yards as the measure of space, and $n = 4$ for the walk, $= 8$ for the trot, &c., as the number of such measures described in one hour, or 3600 seconds:

$$v = \frac{s}{t} = n\frac{1800}{3600} = \frac{n}{2} \quad . \quad . \quad . \quad (1)$$

$$\therefore \quad s = v\,t = \frac{n}{2}\,t \,. \quad . \quad . \quad . \quad . \quad . \quad (2)$$

$$\text{and} \quad t = \frac{s}{v} = \frac{2}{n}\,s \,. \quad . \quad . \quad . \quad . \quad . \quad (3)$$

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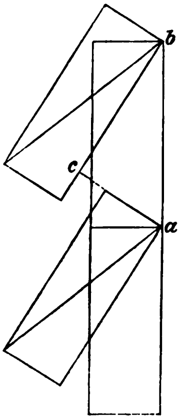
* Vide p. 3, *ante.*

tions is from column, taking *a b*, the distance between the wheeling points (which in this case equals the column distance), as the radius (fig. 58), the distance *a c*, between the lines of movement of the two contiguous ranks wheeled forward from column, will be equal to the sine, and the distance *b c*, between the lines of frontage of such ranks, will be equal to the cosine of the angle wheeled. It will be evident that in this case, either the sine must be equal to or greater than the breadth, or the cosine of the angle wheeled must be equal to or greater than the depth, of the ranks or units of the column on the completion of the wheel, or the movement becomes impossible.

Fig. 58



The angle of inclination in the French service is 22° 30′, and in our service 30°; taking the distance between files in both cases at 3 feet,

$$\cos 22^\circ 30' \times 3 = {\cdot}9238795 \times 3 = 2{\cdot}7716385.$$
$$\cos 30^\circ \times 3 = {\cdot}8660254 \times 3 = 2{\cdot}5980762.$$

This leaves an excess of two inches to the interval between the files in the French service during the incline.

NOTE 3, p. 33.

Breaking into Column from Line: Present System.

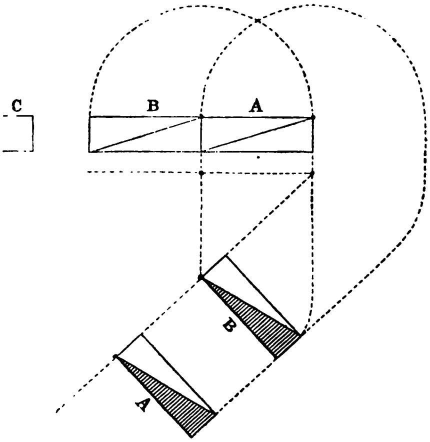
To trace the respective movements of the successive units of the column in performing this manœuvre (see fig. 4, p. 32), let a express the front of the column, h the squadron interval, and ω the angle of inclination at which the retreat is made. Then the difference of the distances described by the contiguous ranks or units of the column, at the moment of arriving at their correct relative positions in column (fig. 59), will be, for the column units A, B, of the same squadron,

$$a\,\{\sec\omega + 1 - \tan\omega\} \quad . \quad . \quad . \quad (1)$$

and for the flank units B, C, of adjacent squadrons,

$$(a+h)\,\{\sec\omega + 1 - \tan\omega\} \quad . \quad . \quad . \quad (2)$$

Fig. 59.



This difference will of course be the start which each rank or unit of the column should have of the succeeding rank in the column.

When each rank of the column has described the equivalent distance on the semicircular arc, with reference to the rate at which the wheel is made, the word 'March' should be given to the succeeding rank.

It is evident that this mathematical expression must vary with the angle of inclination at which the retreat is made, and therefore, unless this angle is determined, no constant or practical rate for timing the movement can be laid down.

When the angle of inclination is 45°, the above expressions become

$$a\sec\omega \quad . \quad . \quad . \quad . \quad (1)$$

$$(a+h)\sec\omega \quad . \quad . \quad . \quad . \quad (2)$$

The secant of 45° taken to one place of decimals is 1·4; therefore in this case the start to be given to each rank of the column, before the succeeding rank receives the word 'March,' should be something less than once and a half the extent of front of the column.

NOTE 4, p. 55.

The March in Column: Present System.

Generally,

$$\text{if} \quad \mathrm{A} : \mathrm{A}' :: \mathrm{R} : \mathrm{R}'$$

$$\text{then } \mathrm{A}' - \mathrm{A} : \mathrm{A}' :: \mathrm{R}' - \mathrm{R} : \mathrm{R}'$$

Here let A = inner arc = depth of ranks (fig. 13)
A' = outer arc = column distance
R = short radius
R' = long radius

and hence $\mathrm{R}' - \mathrm{R}$ = frontage of column.

Then,

inner arc : outer arc :: short radius : long radius,
or, depth of ranks : col. distance :: short radius : long radius.

Hence,

col. dist. — depth ranks : col. dist. :: col. frontage : long radius,

$$\therefore \text{long radius} = \frac{\text{col. dist.} \times \text{col. frontage}}{\text{col. dist.} - \text{depth ranks}}$$

In open column, col. dist. = col. frontage

$$\therefore \text{long radius} = \frac{(\text{col. frontage})^2}{\text{col. frontage} - \text{depth ranks}}.$$

NOTE 5, p. 56.

The March in Column: Present System.

Taking R to represent the radius to the larger or outer circle, x the variable extent of front, and d the depth of ranks

(7 yards), which of course remains constant; we have already shown that in the case of the open column:

$$\text{R} = \frac{x^2}{x - d}.\text{*}$$

In the first place we see that when $x = d$ (that is, when the extent of front of the column equals 7 yards or files), the equation takes the form

$$\text{R} = \frac{x^2}{o}$$

that is, R becomes infinite, and the movement is impossible.

We will now examine what will be the consecutive values of R, upon the supposition that x (the extent of front) increases continually by unity (one file) from 7 files upwards, so as to take successively the values 8, 9, 10, 11, 12, &c.

Taking two consecutive terms of this series, R and R′, for any given value of x, corresponding to values given to the extent of front of x and $x + 1$, they will take the form,

$$\text{R} = \frac{x^2}{x - d} = x + \frac{x\,d}{x - d}$$

$$\text{R}' = x + 1 + \frac{(x + 1)\,d}{x + 1 - d}$$

Hence the difference between any two successive values of R, in the series, is:

$$1 - \frac{d^2}{(x - d)^2 + x - d}$$

It is evident that so long as the fractional part of this difference remains greater than unity, the difference will be subtractive, or in other words the radius will diminish as x the extent of front increases; but from the time that the fractional part of the difference becomes less than unity, the difference will become additive, and the radius will increase directly with the extent of front.

A simple quadratic equation will show that the fractional part of the difference equals unity, and consequently the difference equals 0, when x takes the value 13·5178; and the difference, which up to this point has been subtractive, upon passing through 0 changes its sign, and becomes additive.

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* Appendix, note 4.

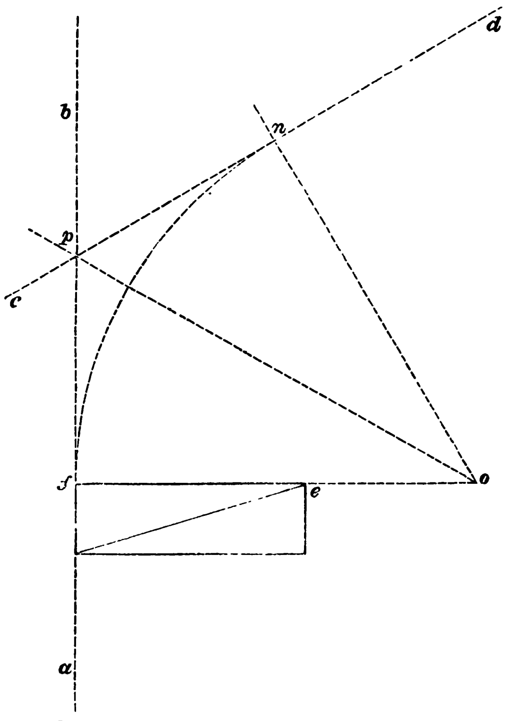
In other words, below an extent of front of 7 files inclusive, the movement is impossible; from 7 up to 13 files inclusive, the radius diminishes as the front increases; and from 14 files upwards inclusive, the radius increases with the extent of front.

Note 6, p. 59.

The March in Column: Present System.

If we suppose $e\,f$ to represent the head of a column moving upon the line $a\,b$, and that it is intended to change the

Fig. 60.



direction to the line $c\,d$, then p is the point of intersection of the old and new direction (fig. 60), and *f p*, the distance of this point from the point *f*, where the wheel should commence, is equal to the tangent of half the angle *f o n*, which has to be wheeled in order to effect the required change of direction to the radius *o f*, upon which the wheel is made; and the point *n*, where the front of the column becomes perpendicular to the new direction *c d*, is 'the proper point' for giving the word 'Forward.'

This tangent *f p*, for any given angle, varies with the radius *o f*; which we have already shown varies with or is dependent upon the extent of front and the column distance.*

Note 7, p. 62.

The March in Column: Present System.

The inner or lesser radius is marked 3⅓ mètres, which, estimating the quarter circle as $\frac{3}{2}$ the radius, gives an arc of just 5 mètres.

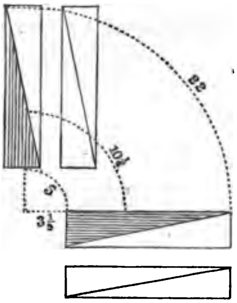


Fig. 61.

This radius of 3⅓ mètres brings us to the centre point of the man's horse on the pivot flank, and this small circle of 5 mètres, upon which the flank man is supposed to move, will just clear the head of the marker's horse, the length of which by the conventional measurement (9 feet) is a little less than the radius, 3⅓ mètres.

Measuring the extent of front of the peloton (12 files) from central point to central point of each man's horse, we have, according to the conventional measurement, 11 mètres, which, added to the lesser radius 3⅓ mètres, gives 14⅓ mètres for the distance from the central point, round which the change is being made, to the central point of the horse of the flank man on the wheeling flank.

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* Appendix, note 4.

If we subtract ⅓ mètre from the distance of 14⅓ mètres thus found, we get 14 mètres for the radius of the arc which the inner knee of the man on the wheeling flank might be supposed to describe, the half of which, 7 mètres, gives the length of the quarter circle arc, 10½ mètres, as marked in the figure, upon which arc the centre point of the radius, which is the regulating point for the pace, is supposed to move.

If, on the other hand, we add ⅓ mètre to the same distance, we get 14⅔ mètres, which gives the length of the quarter circle arc, 22 mètres, as marked in the figure.

The outer knee of the man on the wheeling flank may be supposed to describe this arc, which therefore circumscribes the whole space occupied in the movement.

Measuring from centre to centre, the distance from the pivot man to the fifth file is 4 mètres, which added to the lesser radius of 3⅓ mètres, gives 7⅓ mètres for the distance from the central point to the fifth file. This is ⅓ mètre more than the distance of the true central point, according to the measurements just stated; but in practice this radius is taken as 7 mètres, for the sake of simplicity.

Note 8, p. 65.

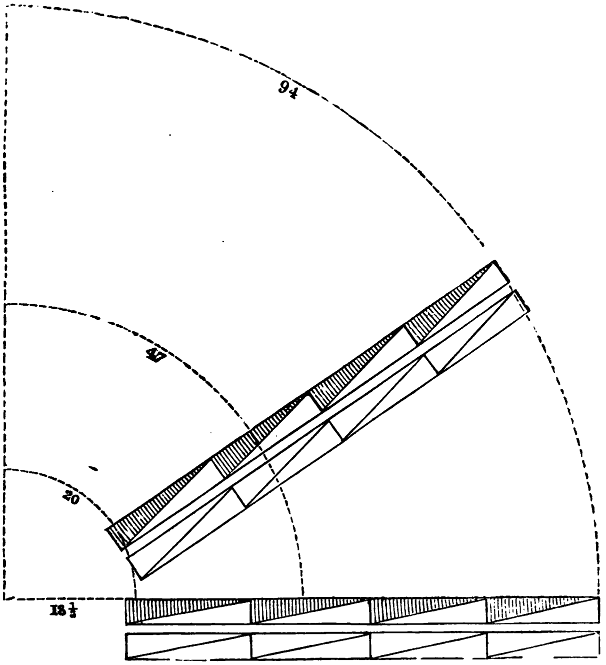
The March in Column: Present System.

In this case the pivot circles round a central point at a distance of 13⅓ mètres, which gives an arc of 20 mètres.

The pivot is represented by the maréchal des logis on that flank, who does not count in the ranks; therefore, measuring from centre to centre 18 mètres, we come to the nineteenth file (counting the pivot), which is the eighteenth file counted in the ranks, or the sixth file of the second peloton.

These 18 mètres, added to the lesser radius 13⅓ mètres, give a radius of 31⅓ mètres, which corresponds to an arc of 47 mètres, upon which the centre regulating point is supposed to travel.

Fig. 62.



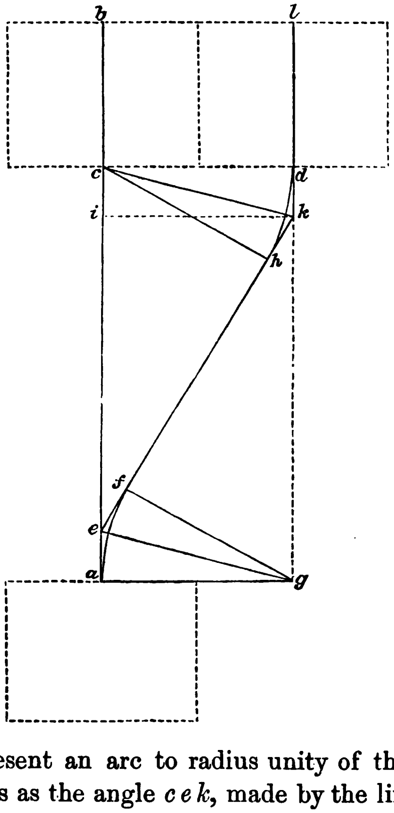
In estimating the front of the squadron of 48 files we must take it at 50, for the maréchaux des logis on the flanks do not count in the ranks; therefore, measuring from centre to centre 49 mètres, and adding the lesser radius of 13⅓ metres, we find the distance from the central point to the centre point of the horse of the maréchal des logis on the wheeling flank, equal to 62⅓ mètres, and adding ⅓ mètre, as in the case of the peloton, we arrive at a radius of 62⅔ mètres, corresponding to an outer circle of 94 mètres, which circumscribes the whole space occupied in the movement.

NOTE 9, p. 88.

Columns of Route: Present Systems.

Let x represent the interval cd of two bodies in line, measured from centre to centre, as in the annexed figure, or from flank to flank, or from any two corresponding points.

Fig. 63.



Let ω represent an arc to radius unity of the same number of degrees as the angle cek, made by the line of oblique movement ek with the direct line ab; or, as the angle agf, through which the body about to form line with the other moves forward into oblique échelon, so as to place its front perpendicular to the line $e\,k$.

These angles $c\,e\,k$ and $a\,g\,f$ are each supplements of the angle $a\,e\,f$, and are consequently equal to each other, and to the angle $h\,c\,d$, $h\,c$ being parallel to $g\,f$.

With centres g and c, and radii $g\,a$ and $c\,d$, describe the arcs $a\,f$, $h\,d$.

Bisect the angles $a\,g\,f$ and $h\,c\,d$ by $g\,e$ and $c\,k$.

Then $a\,e$, $e\,f$, $h\,k$, $k\,d$ are tangents of $\frac{\omega}{2}$ to radius x; $e\,t$ is the cotangent; and $e\,k$ the cosecant of ω to the same radius.

Therefore, the line $a\,c = x\left(\text{cotan}\ \omega + 2\tan\frac{\omega}{2}\right)$. .(1)

and the line $a\,f\,h\,d = x\left(\text{cosec}\ \omega + 2\omega - 2\tan\frac{\omega}{2}\right)$. . . (2)

The échelon movement with which we are now dealing is the incline (*marche oblique individuelle*). The angle of inclination adopted in our service is $\frac{1}{3}$ of a right angle, and in the French service $\frac{1}{4}$ of a right angle.

Hence, in our service . . $\omega = 30°$,
in the French service $\omega = 22°\ 30'$.

Now x varies with the interval; i.e. according to what interchange of column frontage is to be made; but the remainder or coefficient of x in each of these expressions (1) and (2) remains a constant quantity.

Calculating to three places of decimals:

First, where $\omega = 30°$,

$$\begin{aligned} \text{cotan}\ \omega + 2\tan\frac{\omega}{2} &= 1{\cdot}732 + {\cdot}536 \\ &= 2{\cdot}268\ .\ .\ .\ .\ .\ (3) \end{aligned}$$

And

$$\begin{aligned} \text{cosec}\ \omega + 2\omega - 2\tan\frac{\omega}{2} &= \quad + 1{\cdot}048 - {\cdot}536 \\ &= 2{\cdot}512\ .\ .\ .\ .\ .\ (4) \end{aligned}$$

Hence, in our service, $a\,c$ or the direct line $= 2{\cdot}268\,x$; and $a\,f\,h\,d$ or the diagonal line $= 2{\cdot}512\,x$.

Secondly, where $\omega = 22° \ 30'$

$$\cot\omega + 2\tan\frac{\omega}{2} = 2{\cdot}414 + {\cdot}398$$

$$= 2{\cdot}812 \quad . \quad . \quad . \quad . \quad . \quad (5)$$

And

$$\operatorname{cosec}\omega + 2\omega - 2\tan\frac{\omega}{2} = 2{\cdot}613 + {\cdot}786 - {\cdot}398$$

$$= 3{\cdot}001 \quad . \quad . \quad . \quad . \quad . \quad (6)$$

Corollary.

Hence we may establish the distances to be moved in the various changes of frontage of column.

(α) In increasing from single files to files.
Distance to be advanced by front rank man (Note 10),
= direct line + depth of ranks — col. distance.
$= 2{\cdot}268 \times 3 + 8 - 11.$
$= 3{\cdot}804$, which we may call 4 feet.

(β) In diminishing from files to single files.
Distance to be advanced by front rank man of leading rank,
= direct line + col. distance — oblique line (Note 11)
$= 2{\cdot}268 \times 3 + 11 - 2{\cdot}512 \times 3.$
$= 10{\cdot}068$, which we may call 10 feet.

(γ) In diminishing from files to single files.
Distance to be advanced by rear rank man of leading rank,
= oblique line — direct line (Note 12).
$= 2{\cdot}512 \times 3 - 2{\cdot}268 \times 3.$
$= {\cdot}732$, less than 1 foot.

(δ) In increasing from single files to files (French method).
Distance to be moved by front rank man,
= direct line + depth of ranks — col. distance (Note 10).
$= 2{\cdot}812 \times 3 + 18 - 20.$
$= 6{\cdot}436$, which we may call 6 feet.

(ε) In diminishing from files to single files (French method).
Distance to be moved by front rank man,
= direct line + col. distance — oblique line (Note 11).
$= 2{\cdot}812 \times 3 + 20 - 3{\cdot}001 \times 3.$
= 19·433, which we may call 19 feet.

(ζ) In diminishing from files to single files (French method).
Distance to be advanced by rear rank man of leading rank,
= oblique line — direct line (Note 12).
$= 3{\cdot}001 - 2{\cdot}812.$
= ·189, which may be practically disregarded.

(η) In increasing from files to three in front, first, the leading rank must pass from files to single files.
Here distance to be moved by front rank man,
= direct line + depth of ranks — col. distance.
$= 2{\cdot}268 \times 3 + 19.$
= 25·804, which we may call 26 feet.

(θ) The interval and depth of ranks, for the movement of No. 2 file in line with No. 1, are the same as those in (η). Hence the distance to be moved here also is 26 feet.

(κ) In increasing from files to three in front.
The distance requisite to allow No. 3 into line,
= direct line + depth of ranks.
$= 2{\cdot}268 \times 6 + 19.$
= 32·608, which we may call 33 feet.

(λ) In increasing from files to column of four in front, in the French service.
The distance which the leading rank must advance,
= direct line + depth of ranks — col. distance.
$= 2{\cdot}812 \times 6 + 18 - 20.$
= 14.782, which we may call 15 feet.

(μ) In diminishing from column of four in front to files, in the French service.

The distance to be advanced by leading files,

$= \text{direct line} + \text{col. distance} - \text{oblique line}.$

$= 2{\cdot}812 \times 6 + 20 - 3{\cdot}001 \times 6.$

$= 18{\cdot}866$, which we may call 19 feet.

(π) In diminishing from column of four in front to files, in the French service.

The distance to be advanced by rear rank men of leading rank,

$= \text{oblique line} - \text{direct line}.$

$= 3{\cdot}001 \times 6 - 2{\cdot}812 \times 6.$

$= 1{\cdot}134$, which we may call 1 foot.

NOTE 10, p. 89.

Columns of Route: Present Systems.

The distance ab is evidently equal to the direct line added to the depth of ranks. If we add the depth of ranks to the direct line, and subtract the column distance from the sum, the remainder is the distance which it is necessary the leading portion of the column should advance.

NOTE 11, p. 90.

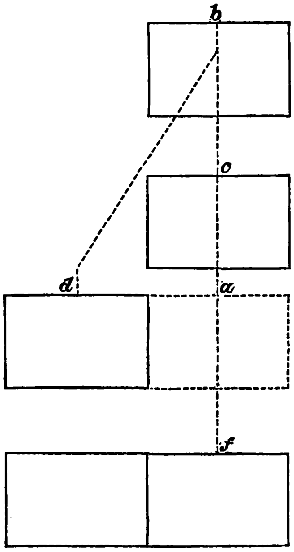
Columns of Route: Present Systems.

$a\ b$ is evidently equal to the direct line added to the column distance $c\ b$. If, therefore, we add the column distance to the direct line, and subtract the oblique line from the sum, the difference will be the start which the leading portion of the first rank of the column should have, before the other portion moves off its ground.

Note 12, p. 92.

Columns of Route: Present Systems.

Fig. 64.



In this case, *f a* and *c b*, being each equal to the column distance, are equal to each other; add *a c* to each, and *f c* is equal to *a b*.

It will therefore only be necessary to take the difference between the direct line *a b* and the diagonal line *d b*.

Note 13, p. 112.

Columns of Route: Proposed Alterations.

All that is gained in time or space by adopting a separate front formation is as follows:—

The last rank of the column moves over the cosecant of the angle of inclination, to radius equal to the extent of front when formed, instead of over the cotangent added to such radius.

In our service, this angle of inclination being 30°, the cosecant to radius 1 = 2, and the cotangent = 1·732.

Therefore the space saved = ·732, say three-fourths the extent of front when formed; hence, in a squadron of 48 files the space saved would be less than 36 yards, and the time saved, if moving at the walk, would be only about 18 seconds; while, in order to perform the movement, there must be a clear space as deep as the column, and 48 yards broad.

NOTE 14, p. 124.

Columns of Route: Proposed Alterations.

The column distance when threes are closed up is nine feet, and when extended eleven feet, therefore the depths of these columns are as nine to eleven.

Hence we deduce the following tables:—

Col. of Threes extended $= \frac{1}{9} = \frac{22}{18}$ col. of threes closed up.
„ Files $= \frac{3}{2}$ of $\frac{11}{9} = \frac{33}{18}$ „ „
„ Single Files $= \frac{6}{2}$ of $\frac{11}{9} = \frac{66}{18}$ „ „

Therefore, the difference of depth between

Col. of Threes extended and Threes closed up is . . . . . . $\frac{4}{18}$ the depth of the col. of threes closed up.
Files „ „ „ $\frac{15}{18}$ „ „
Single Files „ „ $\frac{48}{18}$ „ „

The second of these differences is three and three-quarters (3·75) of the first.

The third is twelve (12) times the first.

We must now find this difference of depth between the columns of threes extended and closed up.

It is evidently $\frac{2}{9}$ of the depth of the column of threes closed up, or what is the same thing, of the extent of front in line.*

But each file in line occupies one yard, so that in measurement files and yards are synonymous; therefore, the difference in yards between the depths of columns of threes extended and closed up is $\frac{2}{9}$ the number of files in line.

Again, this number of yards so found, divided by 2, gives the time in seconds required to pass over this distance at the walk.

Hence we establish the fact, that the number of seconds required to change, at the walk, from column of threes extended to column of threes closed up, is $\frac{1}{9}$ the number of files in the line from which the column is formed.

This multiplied by 3·75 is the time required to change from files, and multiplied by 12 is the time required to change from single files to column of threes closed up, at the walk.

Half this time will be required at the trot, and one-third at the gallop of manœuvre.

NOTE 15, p. 124.

Columns of Route: Proposed Alterations.

Let S = distance passed over by leading rank of column.
S' = distance passed over by last rank of column.
V = pace at which leading rank moves.
V' = pace at which last rank moves.
T = time occupied by leading rank in movement.
T' = time occupied by last rank in movement.

Then $S = VT \;.\; S' = V'T'$

and $T = T'$, $\because$ the time of movement is the same for the whole column.

---

* The depth of the column of threes closed up to wheeling distance differs from the extent of front in line, according to the conventional measurements, by only half a foot. We may therefore consider them practically the same.

$$\therefore S : S' :: V : V'$$

$$\text{and } S - S' : S' :: V - V' : V'.$$

$$\text{Hence } S' = \frac{V'(S - S')}{V - V'} \text{ and } T = \frac{S'}{V'} = \frac{S - S'}{V - V'}.$$

We have seen (*ante*, p. 122) that the difference between the spaces passed over by these two ranks of the column is the difference between the depths of the column passed from and the column passed to.

We have also seen (*ante*, p. 2) that the difference between any two consecutive paces is always $= 2$.

Therefore the time occupied in the movement is always half the difference between the depths of the columns.

In increasing front V is the slower pace.

In diminishing front V is the faster pace.

Hence, to find the space passed over by the leading rank during the movement, we must multiply the time found as above by the slower pace when increasing, by the faster pace when diminishing the front.

NOTE 16, p. 136.

Passage from Column to Line: Proposed Alterations.

Let xy be the original line of movement of the column.

b, m, m', &c., the points where the first, second, third, &c. ranks of the column turn in succession from xy to parallel lines of movement, thus forming direct échelons.

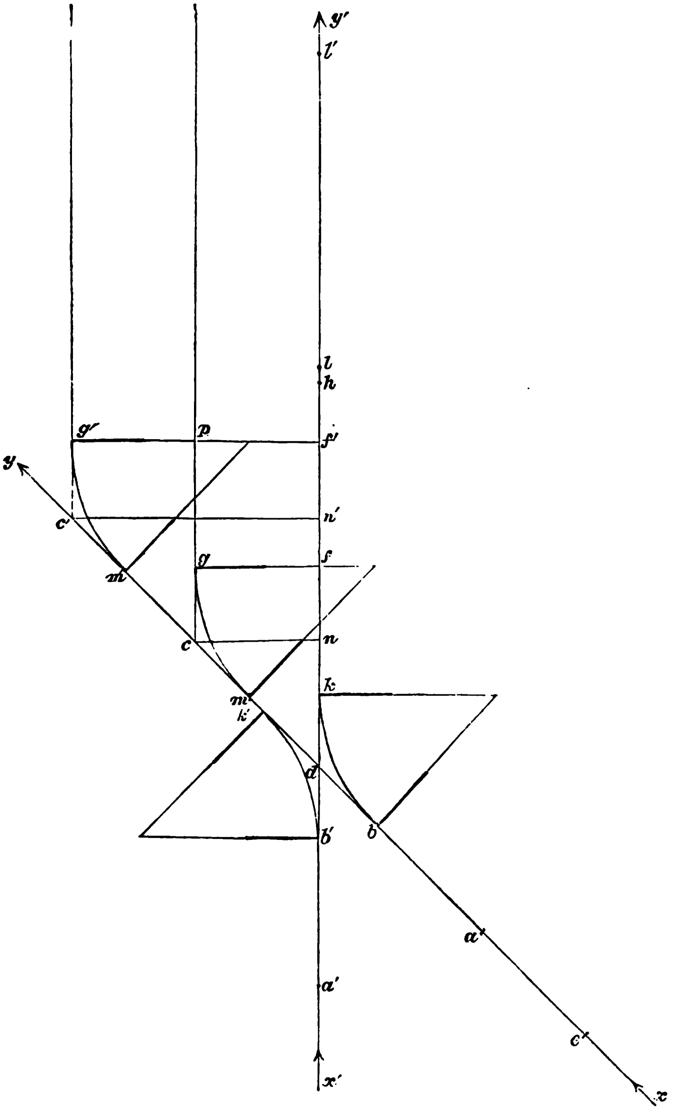
R, the radius of the wheel at each of these points, $=$ the distance from the centre of any rank of the column to the wheeling point.

D, the distance in line between the parallel lines of movement of the column ranks when in échelon, $= gf$, $g'p$, &c.

D', the distance in column between two successive ranks, $= ea$, ab, &c.

(D and D' both being measured from corresponding points in the ranks.)

Fig. 65.



ω, an arc to radius unity of the angle wheeled, or the angle of inclination of the parallel lines of movement with the line of movement of the column, $\therefore$ $\mathrm{R}\omega$ an arc of the same angle to radius R.

Now, suppose the leading rank to be at b, $\therefore$ the second rank at a, third rank at e, &c.; and all ranks to be moving at the same pace.

While the second rank, starting at a, moves the distance amg, which brings it on to its new line of movement, the leading rank, starting at b, and moving at the same pace, passes over a distance $bkl = amg$; and thus the first and second ranks are in direct échelon at the distance fl.

But $bd = \tan \frac{1}{2}\,\mathrm{R}\omega = dk = mc = cg = m'c' = c'g'$, &c.

Hence $bm = dc$, $bm' = dc'$, &c. = &c.

$$\begin{aligned} \therefore\ amg &= ab + bm + \text{arc } mg, \\ &= ab + dc + \text{arc } mg, \\ &= \mathrm{D}' + \mathrm{D}\,\text{cosec}\,\omega + \mathrm{R}\,\omega. \end{aligned}$$

$$\begin{aligned} \therefore\ bkl &= amg, \text{ distance described by the leading rank during the passage of the first two ranks from column to direct échelons,} \\ &= \text{distance described by second rank to form in échelon,} \\ &= \mathrm{D}' + \mathrm{D}\,\text{cosec}\,\omega + \mathrm{R}\omega. \quad \ldots\ldots \quad (1) \end{aligned}$$

Again, while the third rank, starting at e, moves the distance $em'g'$, the first rank moves bkl'.

$$\begin{aligned} \therefore\ bkl' &= \text{distance described by the leading rank during the passage of three ranks into direct échelon from column,} \\ &= em'g = eb + dc' + \text{arc } m'g', \\ &= 2ab + 2\,dc + \text{arc } mg, \\ &= 2\,(\mathrm{D}' + \mathrm{D}\,\text{cosec}\,\omega) + \mathrm{R}\omega. \end{aligned}$$

Similarly, for four ranks,

$$bkl'' = 3\,(\mathrm{D}' + \mathrm{D}\,\text{cosec}\,\omega) + \mathrm{R}\omega.$$

And for n ranks to be thrown into échelon, the distance to be described by the leading rank and the n^{th} rank

$$= (n-1)(\text{D}' + \text{D} \operatorname{cosec} \omega) + \text{R}\omega. \quad . \quad . \quad . \quad . \quad (2)$$

Now let $x'y'$, perpendicular to the future front in line or échelons, be the original line of movement of the column, instead of the diagonal line $x\,y$. The formation will be effected in this case by the second and following ranks turning on to the diagonal line $x\,y$ at the point b', while the leading rank continues to advance along $x'y'$; and the second and following ranks will turn on to parallel lines of movement as before at m, m', &c.

Manifestly $a\,d$ and $a'\,d$ are equal, ∴ the distance $a\,m\,g$, moved by the second rank when the column movement is along $x\,y = a'\,d + d\,m +$ arc $m\,g$; but where the movement of the column is along $x'y'$, the second rank does not move this distance $a'\,d + d\,m +$ arc $m\,g$, but moves a shorter distance; as instead of passing over $b'd + d\,k = 2 \tan \frac{1}{2}\,\text{R}\omega$, it describes the arc $b'k' = \text{R}\omega$; so that when the movement of the column is perpendicular to the future line, the distance to be moved by the second rank to form échelon is less than the distance described by the second rank when the column movement is on the diagonal line by $\text{R}\,(2 \tan \frac{1}{2}\,\omega - \omega)$; and is expressed by

$$\text{D}' + \text{D} \operatorname{cosec} \omega + \text{R}\,\omega - \{\text{R}\,(2 \tan \tfrac{1}{2}\,\omega - \omega)\} \quad . \quad . \quad (3)$$

And this holds good for all the succeeding ranks, until for the n^{th} rank, we arrive at

$$(n-1)(\text{D}' + \text{D} \operatorname{cosec} \omega + \text{R}\omega) + \text{R}\omega - \{\text{R}\,(2 \tan \tfrac{1}{2}\,\omega - \omega)\}. \quad . \quad (4)$$

Returning to the movement along the diagonal line $x\,y$, $b\,k\,f$ and $b\,k\,f'$ are the distances described by the leading rank from the point b to the points f and f', in line respectively with the points g and g', at which the succeeding ranks commence their parallel movement;

and $d\,n = k\,f$, $d\,n' = k\,f'$, &c. = &c.

$\therefore\ bkf = kf + \text{arc } bk,$
$= dn + \text{arc } bk,$
$= \text{D} \cot \omega + \text{R}\omega$ . . . . (5)

and $bkf' =$ the smallest distance to be moved by the leading rank to allow a third rank to form in échelon,
$= 2\,kf + \text{arc } bk,$
$= 2\,\text{D} \cot \omega + \text{R}\,\omega.$

And so on, until the distance from b to the point in line with the point at which the n^{th} rank commences its parallel movement, that is, the smallest distance to be moved by the leading rank to allow an n^{th} rank to form in échelon,

$= (n-1)(\text{D} \cot \omega) + \text{R}\omega$ . . . . (6)

But when the column moves along the perpendicular line $x'y'$, the leading rank, instead of passing over the arc $bk = \text{R}\omega$, passes over a greater distance, viz. $b'd + dk = 2 \tan \frac{1}{2}\, \text{R}\,\omega$; so that when the movement of the column is perpendicular to the future line, the smallest distance to be moved by the leading rank, to allow a second rank to form in échelon, is greater than the distance to be described when the column movement is on the diagonal by $\text{R}(2 \tan \frac{1}{2}\omega - \omega)$; and is expressed by

$\text{D} \cot \omega + \text{R}\omega + \{\text{R}\,(2 \tan \frac{1}{2}\,\omega - \omega)\}$ . . . (7)

and this holds good for all the succeeding ranks, until we arrive for the n^{th} rank at

$(n-1)\,(\text{D} \cot \omega) + \text{R}\,\omega + \{\text{R}\,(2 \tan \frac{1}{2}\,\omega - \omega)\}.$. (8)

Now, when the movement is from the diagonal line,

by (1) $bkl = \text{D}' + \text{D} \operatorname{cosec} \omega + \text{R}\omega$
and by (5) $bkf = \text{D} \cot \omega + \text{R}\omega$
$\therefore\ bkl - bkf = fl =$ distance between the ranks in échelon,
$= \text{D}' + \text{D} \operatorname{cosec} \omega + \text{R}\omega - (\text{D} \cot \omega + \text{R}\omega)$
$= \text{D}' + \text{D}(\operatorname{cosec} \omega - \cot \omega)$ . . . (9)

And the total distance between the first and n^{th} ranks

$= (n-1)\{\text{D}' + \text{D}\,(\operatorname{cosec} \omega - \cot \omega)\}.$ (10)

But when the movement is from the perpendicular line—

$$\text{by (3) } b'k'h = bk'mg$$

$$= \mathrm{D}' + \mathrm{D} \operatorname{cosec} \omega + \mathrm{R}\omega - \{\mathrm{R}(2 \tan \tfrac{1}{2} \omega - \omega)\}$$

and by (7) $b'k'f = \mathrm{D} \cot \omega + \mathrm{R}\omega + \mathrm{R}\,(2 \tan \tfrac{1}{2} \omega - \omega)$

$\therefore\ b'k'h - b'k'f = fl =$ distance between ranks in échelon

$$= \mathrm{D}' + \mathrm{D} \operatorname{cosec} \omega + \mathrm{R}\omega - \{\mathrm{R}(2 \tan \tfrac{1}{2} \omega - \omega)\}$$

$$- \{\mathrm{D} \cot \omega + \mathrm{R}\omega + \mathrm{R}(2 \tan \tfrac{1}{2} \omega - \omega)\}$$

$$= \mathrm{D}' + \mathrm{D}\,(\operatorname{cosec} \omega - \cot \omega) - 2\,\mathrm{R}(2 \tan \tfrac{1}{2} \omega - \omega). \quad (11)$$

so that the distance between any two ranks in the échelon, when the column movement is originally perpendicular to the future front in line, is less than the distance when the movement is diagonal, by $2\,\mathrm{R}\,(2 \tan \frac{1}{2} \omega - \omega)$; and this holds good for n ranks, when the distance between the first and n^{th} ranks is expressed by

$$(n-1)\ \{\mathrm{D}' + \mathrm{D}\,(\operatorname{cosec} \omega - \cot \omega)\} - 2\,\mathrm{R}\,(2 \tan \tfrac{1}{2} \omega - \omega) \quad . \ . \ (12)$$

There are three methods of forming line from échelons or from column:—

I. By halting the leading rank of the échelons, the remainder continuing the original pace till each arrives in line, when it halts.

II. By reducing the pace of the leading rank, the remainder continuing the original pace, till each arrives in line, when it takes up the reduced pace.

III. By increasing the pace of all the ranks except the first, which continues the original pace, each succeeding rank returning to the original rank when in line.

In forming line from échelons, when I. is employed, the distance passed over by the last rank of n échelons, during the passage from échelons to line, is represented by the expression (10) or (12), according as the original movement of the column is diagonal or perpendicular.

When II. or III. is employed, expression (10) or (12) represents the difference of the distances described by the leading rank and last rank during such formation. This difference divided by the difference of the paces equals the time occupied in the formation so effected; and this time so found, multiplied by the term corresponding to either pace, equals the distance described by the rank moving at that pace.

In forming line from column, it is only necessary for the leading rank to advance the distance in expression (6) or (8), before halting if I. is employed; or decreasing its pace if II. is employed; or before the succeeding ranks increase their pace, if III. is employed; the remaining ranks continuing to move along the diagonal line till the last rank wheels up into line at the proper distance from the first.

During the advance of the leading rank, a certain number of the ranks will have passed from column to direct échelons, and upon the halting of, or the reduction of pace by, the leading rank, or the increase of pace by the succeeding ranks, the consequent closing up to line of the ranks of the échelon already formed will leave the necessary space for the passage from column to échelons, and subsequently to line, of the remaining ranks to be formed.

Where II. or III. is employed, the time occupied from the commencement of the change of pace to the moment that any given rank comes into line will be the difference of the distances described by that rank and the leading rank, divided by the difference of their paces.

Hence we derive an expression for the distance described by the leading rank; for if

$v =$ lesser velocity or pace,

$a\,v =$ greater velocity or pace, a being some multiple of v.

Then by (10) this time for the n^{th} rank, the movement being from the diagonal line,

$$= \frac{(n-1)\,\{\mathrm{D}'+\mathrm{D}\,(\operatorname{cosec}\omega-\cot\omega)\}}{v\,(a-1)}$$

and, when the movement is from the perpendicular line by (12):—

$$= \frac{(n-1)\,\{\mathrm{D}'+\mathrm{D}\,(\operatorname{cosec}\omega-\cot\omega)\}-2\,\mathrm{R}\,(\tan\tfrac{1}{2}\,\omega-\omega)}{v\,(a-1)}$$

This expression for the time, multiplied by v, gives an expression for the distance described by the leading rank during the formation of n ranks into line:

When the movement is from the diagonal line—

$$= \frac{(n-1)\left\{D' + D\,(\operatorname{cosec}\omega - \cot\omega)\right\}}{a-1} \quad . \ . \ . \quad (13)$$

When the movement is from the perpendicular line—

$$= \frac{n-1\left\{D' + D\,(\operatorname{cosec}\omega - \cot\omega)\right\} - 2\,R\,(\tan\tfrac{1}{2}\,\omega - \omega)}{a-1} \quad (14)$$

Now this distance so found must evidently not be less than the distance in expression (6) or (8), or there will be collision of the ranks; for the ranks would then come into line together before the correct interval had been gained by the diagonal movement.

The distance (13) and (14) must therefore be equal to or greater than (6) and (8) respectively, and the paces and angles of inclination must be so combined as to insure this.

Now expression (14) for the column moving along the perpendicular is less than (13) for the column moving along the diagonal.

But expression (8) for the column moving along the perpendicular is greater than (6) for the column moving along the diagonal.

If, then, we take (14) = (8) for any particular angle of inclination, the resulting value of a will give (13) to the same angle greater than (6); so that this value of a will fulfil the condition in both cases.

Let (14) = (8), or

$$\frac{(n-1)\left\{D' + D\,(\operatorname{cosec}\omega - \cot\omega) - 2\,R\,(\tan\tfrac{1}{2}\,\omega - \omega)\right\}}{a-1}$$

$$= (n-1)(D\cot\omega) + R\,\omega + R\,(2\tan\tfrac{1}{2}\,\omega - \omega)$$

Let $\frac{D'}{D} = m$; and $\frac{R}{D} = p$; and $n = 2$.

$$\therefore\ D\,\frac{m + \operatorname{cosec}\omega - \cot\omega - 2\,p\tan\tfrac{1}{2}\,\omega + p\,\omega}{a-1}$$

$$= D\,(\cot\omega + 2\,p\tan\tfrac{1}{2}\,\omega)$$

$$\therefore \quad a = \frac{m + \operatorname{cosec} \omega + 2p\,\omega - 2p \tan \frac{1}{2}\omega}{\cot \omega + 2p \tan \frac{1}{2}\omega} \quad . \ . \ . \quad (15)$$

This is the limiting value for a, and the value of a employed in the combination of paces with the different angles must not exceed this.

We now proceed to the practical application of these formulæ.

We find by (2) that the distance from b on the original line of movement of the column, which the leading rank advances in throwing n ranks of the column into échelon, is expressed by

$$(n-1)(\mathrm{D}' + \mathrm{D} \operatorname{cosec} \omega) + \mathrm{R}\,\omega$$

but if we suppose the leading rank to start from the point k, on the new line of movement, the distance it advances is expressed by

$$(n-1)(\mathrm{D}' + \mathrm{D} \operatorname{cosec} \omega)$$

whether the column be originally moving on either the diagonal or perpendicular line.

If, as before, $\frac{\mathrm{D}'}{\mathrm{D}} = m$, this expression becomes

$$(n\,d - d)(m + \operatorname{cosec} \omega)$$

But $n =$ the number of ranks in the column,
and $d =$ the extent of the column frontage,
$\therefore nd =$ the extent of front in line, and
$m + \operatorname{cosec} \omega =$ the distance the leading rank advances to throw n ranks into échelon, expressed in terms of the extent of front in line (less one column rank, which may be disregarded).

We will consider only the angles usually employed, viz.:—

Quarter right or left . . . . . = 22° 30′
Half right or left . . . . . = 45°
Three-quarters right or left . . = 67° 30′
Right or left wheel . . . . . = 90°

and the columns of threes and divisions.

Table I.

In Column of Threes $m = \frac{D'}{D} = \frac{11}{9}$.

If $\omega = 22^\circ\ 30'$, $m + \operatorname{cosec}\omega = 3{\cdot}8$
$= 45^\circ$ „ „ $= 2{\cdot}6$
$= 67^\circ\ 30'$ „ „ $= 2{\cdot}2$
$= 90^\circ$ „ „ $= 2{\cdot}2$

In Column of Divisions $m = 1$.

If $\omega = 22^\circ\ 30'$, $m + \operatorname{cosec}\omega = 3{\cdot}6$
$= 45^\circ$ „ „ $= 2{\cdot}4$
$= 67^\circ\ 30'$ „ „ $= 2{\cdot}$
$= 90^\circ$ „ „ $= 2{\cdot}$

Again, we find by (6) that in order to give room for the line formation of any number of ranks of a column, the leading rank must, previous to halting, or changing its pace, &c., advance a distance expressed by

$$(n-1)(D\cot\omega) + R\,\omega$$

provided the column be moving originally along the diagonal line.

But by (8) if the original movement of the column be on the perpendicular line, the leading rank must in addition move a distance expressed by

$$R\,(2\tan\tfrac{1}{2}\omega - \omega)$$

This additional distance is, however, so small, that it may practically be disregarded; for

If $\omega = 22^\circ\ 30'$, $2\tan\frac{1}{2}\omega - \omega = {\cdot}005$
$= 45^\circ\ 30'$ „ „ $= {\cdot}043$
$= 67^\circ$ „ „ $= {\cdot}158$
$= 90^\circ$ „ „ $= {\cdot}429$

and as, in column of threes, $R = 13$ feet, and in column of divisions, $R =$ the extent of column front, we find the greatest value of $R\,(2\tan\frac{1}{2}\omega - \omega)$ is in column of threes less than 6 feet, and in column of divisions less than half the division.

Therefore we may consider that, under all circumstances, the required distance which must be moved by the leading rank previous to halting, &c., is represented by the expression

$$(n-1)(\mathrm{D}\cot\omega)+\mathrm{R}\,\omega$$

Estimating as before from the point k, the distance to be advanced in terms of the front in line is represented by

$$\cot\omega.$$

Table II.

$$\text{If } \omega=22^\circ\ 30', \cot\omega=2{\cdot}4$$
$$=45^\circ \quad ,, \ =1{\cdot}0$$
$$=67^\circ\ 30', \quad ,, \ =0{\cdot}4$$
$$=90^\circ \quad ,, \ =0{\cdot}0$$

Again we find, by (13), that when the movement is originally on the diagonal line, the distance described by the leading rank during a line formation from column effected on the move by a combination of paces, is expressed by

$$(n-1)\frac{\mathrm{D}'+\mathrm{D}(\operatorname{cosec}\omega-\cot\omega)}{a-1};$$

and by (14), that this is diminished, when the original movement is perpendicular, by an amount which is not appreciable in practice, as above shown.

Therefore, under all circumstances, the distance described by the leading rank during a formation of line from column, effected on the move by a combination of paces, is expressed by—

$$(n-1)\frac{\mathrm{D}'+\mathrm{D}(\operatorname{cosec}\omega-\cot\omega)}{a-1}$$
$$=nd-d\,\frac{m+\operatorname{cosec}\omega-\cot\omega}{a-1};$$

that is to say, it is expressed in terms of the front in line by

$$\frac{m+\operatorname{cosec}\omega-\cot\omega}{a-1}$$

Again, by (15) we find that when v and av represent the paces by means of which the movement is to be effected, the limiting value of a is expressed by

$$a = \frac{m + \operatorname{cosec} \omega + 2p\omega - 2p \tan \frac{1}{2}\omega}{\cot \omega + 2p \tan \frac{1}{2}\omega}$$

The values of this expression are as follows:—

Table III.

In column of threes, $m = \frac{11}{9}$; and $p = \frac{13}{9}$.

If $\omega = 22° 30'$, $a = 1{\cdot}47$
$= 45°$ $a = 1.68$
$= 67° 30'$, $a = 1{\cdot}60$
$= 90°$ $a = 1{\cdot}18$

In column of divisions, $m = 1$; and $p = 1$.

If $\omega = 22° 30'$, $a = 1{\cdot}42$
$= 45°$ $a = 1{\cdot}77$
$= 67° 30'$, $a = 1{\cdot}78$
$= 90°$ $a = 1{\cdot}57$

The paces, by the combination of which the line formation on the move is to be effected, are

The walk . . .	2 yards per second.
The trot . . .	4 „ „
The gallop . . .	6 „ „

The combinations of which are as follows:—

1. The walk and trot.
2. The trot and gallop.
3. The walk and gallop.

The trot is twice as fast as the walk, the gallop once-and-a-half the trot, and three times the walk, so that

In the first combination	$a = 2$
In the second combination	$a = 1{\cdot}5$
In the third combination	$a = 3$

Referring to the Table (III.) of limiting values of a, we find that when the angle of inclination is 22° 30′, none of these combinations are applicable, though the second is very nearly so, in fact may be considered practically applicable; when the angle is 45° or 67° 30′, the second combination only is applicable; but when the angle is 90°, the second combination is applicable for column of divisions, but not for column of threes; and we find that the first and third combinations are never applicable.

The values of $\frac{m + \operatorname{cosec} \omega - \cot \omega}{a - 1}$, expressing in terms of the extent of front in line the distance described by the leading rank during the formation on the move, are as follows: $a - 1$ being equal to 1, ·5, or 2, according as the first, second, or third combination of paces is employed.

Table IV.

	Value of $\frac{m + \operatorname{cosec} \omega - \cot \omega}{a - 1}$		
	1st Combination. Walk and Trot.	2nd Combination. Trot and Gallop.	3rd Combination. Walk and Gallop.
IN COLUMN OF THREES, WHERE $m=\frac{11}{9}$.			
If $\omega = 22° 30'$ . .	1·42	2·84	0·71
$= 45°$ . .	1·63	3·26	0·81
$= 67° 30'$ . .	1 89	3·78	0·94
$= 90°$ . .	2·22	4·44	1·11
IN COLUMN OF DIVISIONS, WHERE $m=1$.			
If $\omega = 22° 30'$ . .	1·20	2·40	0·60
$= 45°$ . .	1·41	2·82	0·70
$= 67° 30'$ . .	1·67	3·34	0·83
$= 90°$ . .	2·00	4·00	1·00

Of these we have above shown that the second combination of paces only is applicable when the line formation is made directly from column on the move.

But if the ranks of the column be disengaged in the first instance by throwing a certain number of them into direct échelons, any combination of paces may be adopted, and the greater the difference of pace between the leading and succeeding ranks, the sooner will the formation be completed.

We have shown that in order to throw the requisite number of ranks into échelons before the pace of the leading or succeeding ranks is altered, the leading rank must describe a distance expressed in terms of the extent of front in line by

$$\cot \omega;$$

during which advance a certain number of the remaining column ranks disengage by passing from column to direct échelons, leaving room for the remainder to do the same.

Therefore, if it is desired to employ the first or third combination of paces, the leading rank must advance after the commencement of the formation a distance equal to the term in Table II. corresponding to the angle of inclination, at the original pace of manœuvre, before it decreases, or the succeeding ranks increase, that pace.

From the moment that the change in the pace commences, the term in Table IV. corresponding to the angle of inclination will give the distance described by the leading rank while the formation is being completed.

Thus, in order to employ the first or third combinations of paces, the leading rank must advance, from the commencement of the movement to the completion of the formation, a distance equal to the sum of the corresponding terms in Table II. and Table IV.

The values thus found for the distances to be described by the leading rank in order to employ the first and third combinations of paces, expressed in terms of the extent of front in line, are as follows:—

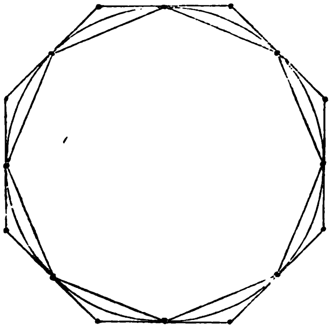
Table V.

	First Combination. Walk and Trot.	Third Combination. Walk and Gallop.
In Column of Threes.		
If $\omega = 22° 30'$ . .	3·8	3·1
$= 45°$ . .	2·6	1·8
$= 67° 30'$ . .	2·2	1·3
$= 90°$ . .	2·2	1·1
In Column of Divisions.		
If $\omega = 22° 30'$ . .	3·6	3·0
$= 45°$ . .	2·4	1·7
$67° 30'$ . .	2·0	1·2
$90°$ . .	2·0	1·0

Note 17, p. 163.

March in Line: Proposed Alterations.

Fig. 66.



If a rectilinear equilateral figure of any number of sides should be circumscribed about a circle, and also a rectilinear equilateral figure of the same number of sides be inscribed within the circle, so that the sides of the circumscribed figure form tangents to the curve at the extremities of the chords which form the sides of the inscribed figure, then the more the number of the sides of the circumscribed and inscribed figures are increased, and consequently the more the sides are diminished, the more will the perimeters of the circumscribed and inscribed figures tend to a coincidence with the curve. In fact, the curve is nothing more than the line of tangents or chords, indefinitely increased in number and diminished in length. The series of tangents or chords described in the progressive action of the horse on the reverse flank, during the wheel, tend so closely to a coincidence with what is commonly called the circular curve, that the movement may be considered circular, and the rules of execution may be framed accordingly; but large bodies and lines of considerable extent are less pliable and manageable, and it has been found in practice that we can no longer consider the individual horseman as the unit during the movement. We can therefore only attempt as close an approximation to the circular movement as the nature of the case will admit.

The units must be increased to divisions, troops, or squadrons, and consequently the series of tangents or chords, successively described in the progressive movement of such units during the wheel or change of front, becomes sensibly separated from the line of the curve.

It is evident, that the less the change which is effected at any one time, in performing the circular movement, the more will the line of movement of the reverse flank tend to a coincidence with the curve.

This alone would be a reason for making each successive change as small as possible.

When the oblique échelon is employed, the movement of the échelon on the reverse flank during the change is on the line of chords.

When the direct échelon is employed, the movement of the reverse flank is on the line of tangents.

NOTE 18, p. 165.

March in Line: Proposed Alterations.

In the oblique échelon formation, taking the distance between the perpendicular lines of movement of the flank échelons, when in line, as the radius, the distance between the lines of movement, perpendicular to the front of the same bodies, when in échelons is equal to the cosine of the angle wheeled from line by the ranks of the échelons. Therefore, the distance between the lines of movement when in line exceeds the distance between the same lines when in échelon by a distance equal to the versed sine of the angle wheeled.

In the direct échelon formation, with the same radius, if we wheel the échelons into line, the distance between the new lines of movement is equal to the secant of the angle wheeled from échelon into line by the ranks of the échelons. Therefore the distance between the lines of movement of the bodies, when in the new line, exceeds the distance between the same lines when in the original formation by the difference between the radius and the secant of the angle wheeled.

The aggregate amount of the regulated intervals will evidently equal one-fifth of the radius taken.

Therefore, we shall reach the limit to the possibility of forming line from oblique échelons of squadrons by the direct movement, when the versed sine of the angle wheeled equals $\frac{1}{5}$.

$$\text{vers. sin. } 36^\circ\ 53' = 2 = \tfrac{1}{5}$$

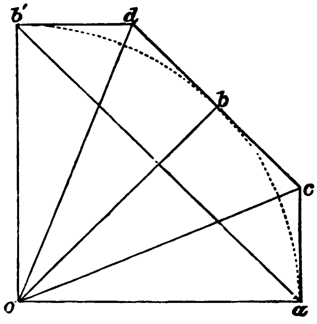
Therefore this angle may be taken as the limit, and when the angle wheeled into échelon of squadrons from line exceeds 36° 53′, the line formation by the direct movement will be impossible.

NOTE 19, p. 170.

March in Line: Proposed Alterations.

In making a change *a o b*, amounting to the eighth of the circle, according to the proposed system, by means of the direct échelon formation, the inner flank of the squadron on the reverse flank of the line passes over the line of the tangents *a c*, *c b*. To this must be added the arc of 45° to radius equal to the extent of front of the squadron, such arc being wheeled at the point *c*.

Fig. 67.



In making the same change, according to the present system, by means of the oblique échelons of troops, the inner flank of the troop, on the reverse flank of the line, passes over the line of the chord *a b*. To this must be added the arc of 45° to radius equal to the extent of front of the troop, one half of this arc being wheeled at the commencement of the movement, and the remaining half at its termination.

In making the change *a o b*, amounting to the quarter circle, according to the proposed method, the inner flank of the flank squadron passes over the line of the tangents *a c*, *d b′*; to which must be added the arc of 90° to radius equal the squadron front, one half of this arc being wheeled at the point *c*, and the remaining half at the point *d*.

In making the same change, according to the present system, the inner flank of the flank troop passes over the line of the chord *a b′*. To this must be added the arc of 90° to radius equal the front of the troop, one half of this arc being wheeled at the commencement of the movement, and the remaining half at its termination.

Taking x to represent the extent of front of the squadron, and n the number of squadrons; when the change is made according to the proposed system, the radius will equal

$$(n-1)\frac{5}{4}x$$

and when the change is made according to the present system, the radius will equal

$$(n-1)\frac{5}{4}x+\frac{x}{2}.$$

Taking ω to represent the amount of the change, or the angle wheeled by the whole line, the distance described by the reverse flank of the line in the two cases will be:

Proposed method:—

$$2\,(n-1)\,\frac{5}{4}\,x\tan\frac{\omega}{2}+x\,\omega.$$

Present method:—

$$2\,(n-1)\,\frac{5}{4}\,x\sin.\frac{\omega}{2}+\frac{x}{2}\sin.\frac{\omega}{2}+\frac{x}{2}\,\omega.$$

The difference,—

$$\left\{5\,(n-1)\left\{\tan.\frac{\omega}{2}-\sin.\frac{\omega}{2}\right\}+\omega-\sin.\frac{\omega}{2}\right\}\frac{x}{2}$$

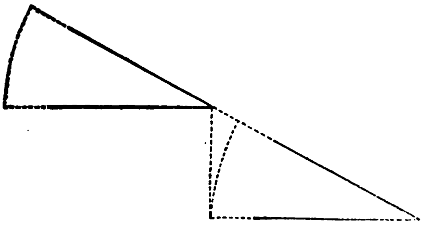
will be the difference of the distances described by the reverse flank in the two cases.

Taking as usual (for an example) a regiment of four squadrons of 48 files each, the difference when the change equals the eighth of the circle will be found to equal (leaving out decimals) 10 yards, and when the change equals the quarter circle, 28 yards.

Note 20, p. 182.

March in Line: Proposed Alterations.

Fig. 68.



If line be formed from direct échelons of squadrons, by the wheel of the units composing the échelon into line, taking the squadron front and interval as radius, the échelon distance will be represented by the tangent, and the extension of the interval by the difference between the radius and secant of the angle wheeled.

According to our Regulations, the interval in line equals one-fourth of the extent of front of the squadron; therefore, if we take x to represent the extent of front of the squadron, $1{\cdot}25\,x$ will represent the radius, equal to the extent of front and interval.

Let the angle wheeled into line be one-sixteenth of the circumference of the circle, that is to say an angle of 22° 30′.

The tangent of 22° 30′ (to two places of decimals) is

$${\cdot}41 \text{ the radius;}$$

$$\text{and } 1{\cdot}25 \times {\cdot}41 = {\cdot}5125.$$

Therefore, when line is formed from direct échelons at a distance equal to ${\cdot}5\,x$ (half squadron distance) by the wheel of the ranks composing the échelons, the angle wheeled into line will equal 22° 30′, or quarter right or left.

The secant of 22° 30′ (to two places of decimals) equals

$$1{\cdot}08 \text{ the radius}$$

$$\text{and } 1{\cdot}25 \times {\cdot}08 = 1{\cdot}35.$$

Therefore when, under these circumstances, the wheel into line is made from direct échelons, the extension of the interval between squadrons, equal to the difference between the secant and the radius, is ${\cdot}1\,x$, which is less than half the regulated interval of ${\cdot}25\,x$.

Therefore the extension of the interval between squadrons is less than half the regulated interval in line.

NOTE 21, p. 195.

Direct Echelons.

As the échelon is formed at half squadron distance, it will be evident that the distance described by the rear squadron, in reaching the alignment of the leading squadron of a formation in échelons of n number of squadrons, and thus forming line by the direct movement to the front, is

$$(n-1)\frac{x}{2}$$

x representing, as usual, the squadron front.

$$(n-1)\frac{x}{2}$$

will also express the distance described by the leading squadron in forming échelons from line; and twice this distance,

$$(n-1)\,x$$

will evidently equal the distance described by the rear squadron in reversing the échelons. It follows therefore, from what has been already stated with reference to formations on the move, that the distance described by the squadron moving with the least velocity, in the formation of line from échelons or of échelons from line, on the move, will equal

$$\frac{n-1}{a-1}\,\frac{x}{2}$$

a (as before) being the exponent of the ratio of the two velocities combined to effect the movement; and twice this distance,

$$\frac{n-1}{a-1}\,x$$

will equal the distance described by the squadron moving with the least velocity during the time the échelons are being reversed on the move.

The values of a, in the three combinations which can be formed from the rates of manœuvre, are as follows:—

Walk and trot $a = 2$.
Trot and gallop „ $= 1{\cdot}5$.
Walk and gallop „ $= 3$.

and the corresponding values of $a-1$ will be:—

Walk and trot $a-1 = 1$.
Trot and gallop „ $= {\cdot}5$.
Walk and gallop „ $= 2$.

The above distances (in yards) divided by 2 will give the time (in seconds) of describing them at the walk, and consequently the time occupied in effecting the different movements specified.

When the pace is the trot, one-half, and when the pace is the gallop, one-third of the above time will equal the time occupied.

Wheel of the Squadrons.

If we take ω to represent the arc wheeled (to radius unity) $x\,\omega$ will evidently represent the distance described by the reverse flank of the squadron during the wheel; and the time (in seconds) occupied, corresponding to the pace employed, will be:—

$$\text{Walk } \frac{x\,\omega}{2}$$

$$\text{Trot } \frac{x\,\omega}{4}$$

$$\text{Gallop } \frac{x\,\omega}{6}$$

Or if we find the time occupied in performing the wheel at the walk, it will be performed at the trot in one-half, and at the gallop in one-third of such time.

Note 22, p. 255.

Artillery combined with Cavalry.

Let $a\,b$ and $c\,d$ be two squadrons in direct échelons at half distance, and let the leading squadron be wheeled forward an angle of 45° to $a\,b'$.

It has been already shown that when squadrons are formed in direct échelons at half distance, the échelon distance $c\,f$ is equal to the tangent of 22° 30′, to radius equal to the squadron front and interval.

Produce $c\,f$, to meet the tangent $f'\,t$ in t, and $f\,t$ to meet $a\,f$ produced in g.

Join gc, and make cd' equal to cd; ab' and cd' will evidently represent the position of the two squadrons ab and cd, when wheeled forward the eighth of the circle to the reverse hand from direct échelons at half distance; and $f'g$, the perpendicular distance between ab' and cd', is evidently equal to af', the squadron front and interval. While the second squadron moves from c to h, and wheels one-eighth of the circle, the leading squadron will have wheeled one-eighth of the circle, and moved forward a distance ak equal to ch; consequently the distance in column will be equal to $ah + hc$.

Fig. 69.

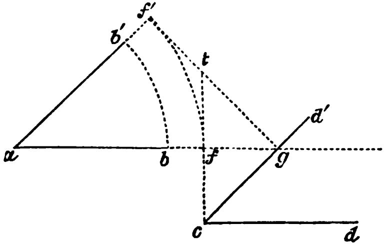
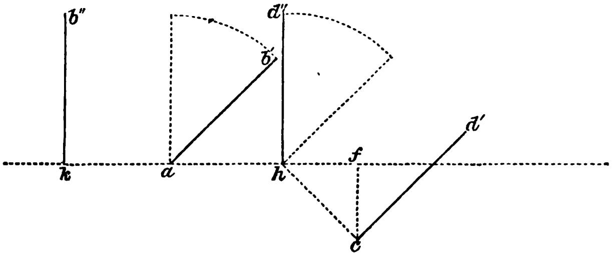


Fig. 70.



Now hc is the secant of 45° to radius $cf = 24$ yards.

Therefore $hc = 33{\cdot}6$ yards.

And $ah = af - hf = 60$ yards $- 24$ yards $= 36$ yards.

Therefore the distance in column between the first and second squadrons will be 69·6 yards; or between 9 and 10 yards in excess of the correct distance.

This difference will have no effect in practice, and the distances between the squadrons of the remainder of the column will be correct.

NOTE 23, p. 258.

Artillery combined with Cavalry.

Let g represent the distance of the enemy from the last position of the artillery at the moment that it is passed and masked by the cavalry advancing to the charge;

d the distance of our own cavalry from the last position of the artillery at the moment that any given round is fired from that or any other position;

d' the distance of our cavalry at the same moment from the position from which such round is fired.

Then the distance from the enemy to the position at which such round was delivered

$$=2d+g-d'$$

Applying this to the present case, and supposing the point of collision to be at a distance from the last position of the artillery of 120 yards; at the moment when the first round is fired from the last position but one of the artillery,

$$2d+g-d'=2\times 420+240-180$$
$$=900$$

At the moment when the last round is fired from the same position,

$$2d+g-d'=2\times 240+240-240$$
$$=480$$

At the moment when the first round is fired from the last position of the artillery,

$$2d+g-d'=2\times 120+240-120$$
$$=360$$

At the moment when the last round is fired from the last position of the artillery,

$$2d+g-d'=0+240-0$$
$$=240$$

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